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Staff Changes

THE displacement of power station officials is a subject of growing interest and importance now that we have reached the stage when so much depends upon the measures that have to be taken to bring success to our efforts to secure a larger consumption of electricity.

It has been mentioned several times this session at public functions and it is exercising the minds of large numbers of men who are engaged in technical operations connected with electricity supply undertakings, some of whom are naturally anxious with regard to the future.

It is not, however, a particularly new problem; it has been raised in so many different ways during the last few years that it can hardly take anybody unawares, though the march of events naturally brings us nearer to more definite action.

Mr. Nichols Moore, in a speech at the annual dinner of the South Wales Section of the Electrical Power Engineers' Association, repeated the advice that has been so often given, that engineers should turn their attention very definitely to the sales side of the industry and equip themselves for a change-over to service in commercial positions as they presented themselves. Such counsel has been addressed to them over and over again editorially, and by individual contributors, in the ELECTRICAL REVIEW. We have not, however, gone so far as to suggest that the E.P.E.A. should alter its rules so as to admit to its ranks men who are not competent engineers.

The president of the Association (Mr. D. J. Duffy), in replying to Mr. Moore's remarks discountenanced any such change in membership conditions and doubtless his desire to maintain the standard of qualifications has the general support of his members. But it is unlikely that in holding that view anybody will be blind to the fact that while there will be many positions on the commercial side of distributing undertakings in which engineers will stand the better chance there are various other openings, some of them of a quite new kind, in which commercial or business-getting or sales promotion qualifications without a too-pronounced technical streak will be essential.

After all, the first consideration will have to be the development of consumption, both domestic and industrial. The men best qualified to bring this about will be needed—the circumstances governing or dictating appointments and deciding as to the suitability of qualifications, technical or otherwise, will vary in different areas and in different concerns.

Some undertakings have gradually progressed in their organisations so that a change over from generation and distribution, to distribution and enlightened selling, will make little difference in personnel. Others will not find it practicable to make the required progress without a substantial addition to or substitution for existing staffs.

Some station changes in prospect will render a number of employés no longer necessary. The interests of such will, of course, receive the consideration of the Displacement Board, but the man who knowing one side of the business has been enterprising enough, or shall we say has had the opportunity and has taken advantage of it, to prepare himself for technico-commercial life, should feel that he has a brighter outlook than those who prefer to be engineers and nothing but engineers.

A Good Beginning

E.D.A. has begun 1934 well by holding at Birmingham the first of a series of conferences. It was organised by the local Circle for "members of staffs of the electrical industry" in the area. This description left the door of the Imperial Hotel open on Wednesday and Thursday this week to almost everybody electrical who was able to release himself from his ordinary duties. The subjects placed before the conference by men who know them well included

certain aspects of electric lighting, the electrical equipment of new houses, the warming of buildings electrically, and so on, but two less usual matters brought under discussion were "competition from inefficient lamps" and its effect on the industry, and "finance and credit in the electrical industry." The luncheon yesterday was the first official Circle event addressed by the new Executive Chairman of E.D.A., Sir William Ray. At the time of his appointment Sir William announced that it was his intention to meet the Circles in their own areas as soon as possible. We hope that as a result of his goings to and fro he will succeed in promoting a determination everywhere for a "pull all together."

A Bequest

THE announcement that the residue of the estate (£15,821) of the late Lt.-Col. Bourke, after bequests to servants, is to go to the Faraday Society for use in such manner as is calculated best to assist advanced human knowledge, serves as a reminder that such bequests to electrical and allied scientific organisations have been rare in recent years. It is stated that Lt.-Col. Bourke, who was formerly in the Indian Medical Service, was one of the founder-members of the Faraday Society thirty years ago. It may not be out of place to remark that there are many very deserving institutions and associations directly connected with the electrical profession and industry which would yield a rich return upon substantial legacies left for research or for benevolent purposes. We will venture to hope that these lines will catch the eye of somebody who has gained eminence and wealth electrically and is willing to perpetuate his memory and service by ensuring that his financial support shall not cease when his name regrettably falls from the roll of membership.

Mathematics and the Oscillograph

WHILE mathematics provides a convenient method of explaining ascertained results, we are with those who, at the last I.E.E. meeting, said that they would use it for forecasting also. Some determining factors might be overlooked or unknown, but empirical checks can generally be established before taking as conclusive, in a practical sense, anticipations founded on a purely mathematical basis. It is to investigations of the type made by Messrs. J. L. Miller and J. E. L. Robinson, with the aid of facilities offered by Messrs. Ferranti, that we must look for a high degree of transmission reliability, for example. The use of the cathode-ray oscillograph will do much to reduce the number of troubles that can honestly be attributed to *force majeure*, and the course of nine lectures on the subject to be delivered at East London College on Mondays (starting on January 22nd) have a distinctly practical bearing on present-day problems.

Refrigeration

WE have from time to time urged that refrigeration ought to be regarded as an all-the-year load rather than as a merely summer-time demand. Although most disease germs flourish at higher temperatures, the bacteria that cause meat to "go bad," for example, are active at only a few degrees above freezing point. These bacteria owe their existence in the food to infection before sale, and the function of refrigeration is to delay the time when the food becomes inedible. In a report on the storage of meat in small refrigerators (No. 43, price 9d.), issued by the Department of Scientific and Industrial Research, the liability to deterioration with time is shown to decrease rapidly between 60 deg. and 40 deg. F., so that a variation of several degrees within this range is not important. Below 40 deg. the curve flattens and approaches the time axis asymptotically, so that just above zero a small temperature variation makes an appreciable difference. As an example, "slime," which might be evident in two days on meat kept at 40 deg., would take ten days to appear at freezing point. It may be deduced from this that it is not enough to keep food at some temperature below that experienced on a hot summer's day or in an artificially heated kitchen in the winter; it should be kept as near zero as possible, and the refrigerator should be of ample capacity to avoid overloading.

Mains Disturbance Suppression

INTERFERENCE with wireless reception is best dealt with at the source, but this is not often practicable. By far the greater proportion of the disturbances is due to mains-borne radiation, and suppressors designed to overcome this type of interference on domestic premises should be placed as near the service entry as possible, in order to avoid re-radiation from the wiring installation. The Post Office authorities are prepared to give their services to licence-holders to trace the source of the trouble. A good earth connection is necessary for the efficient by-passing of high-frequency currents to earth, and also to make the energy consumption negligible. In view of this, and the desirability of installing supplementary h.f. chokes in extreme cases, and also of the proximity of the suppressor set to the main switch, the consumer should be advised by dealers to secure the services of a competent electrician to ensure safety and satisfactory installation.

Little by Little

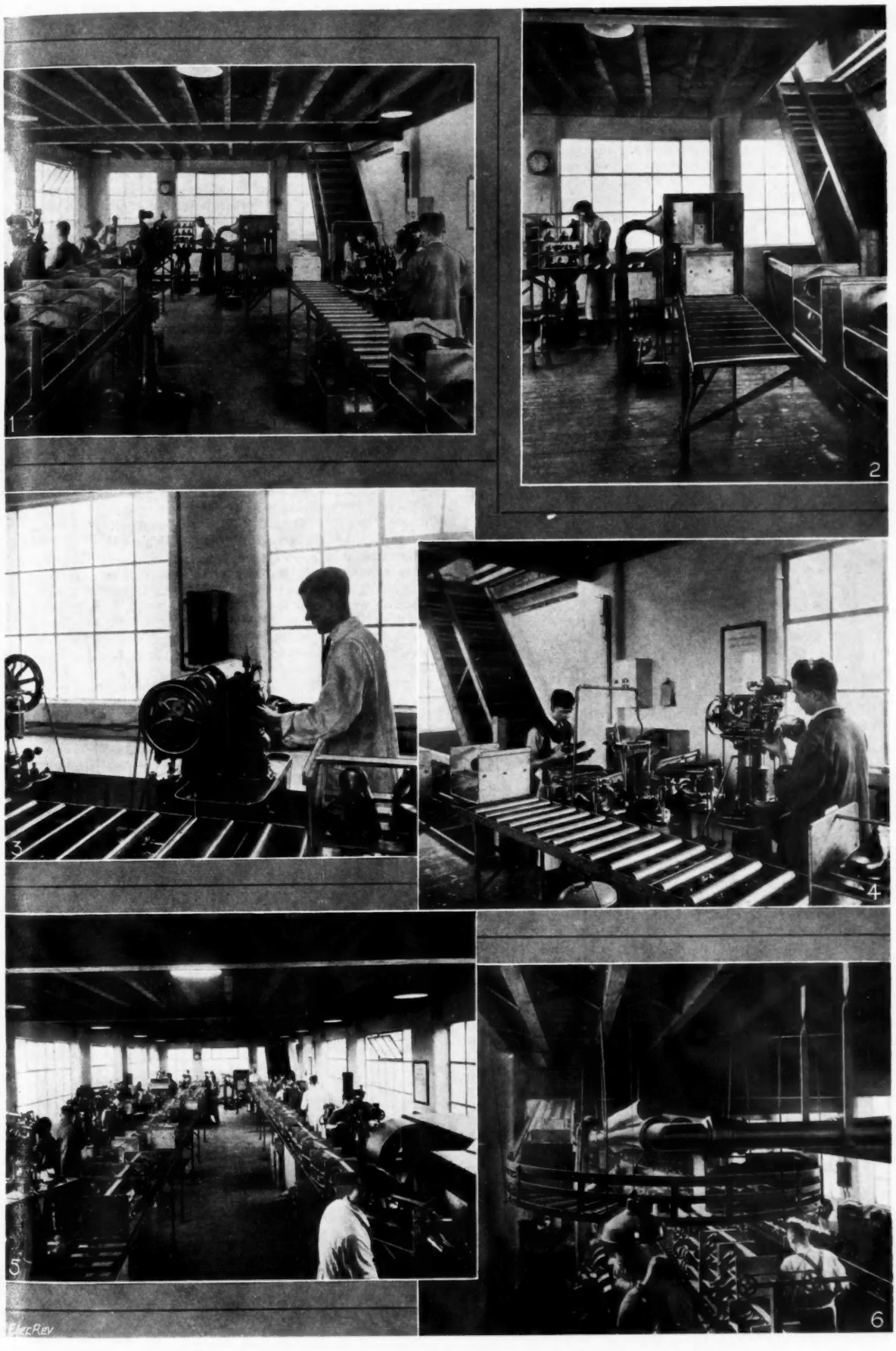
THE load provided by the villages and hamlets that are being connected to the system of Clitheroe Corporation is not very large. In a sense that makes the enterprise of Mr. A. H. Todd, the borough electrical engineer, all the more significant. The object of the undertaking, to quote the go-ahead chairman of the Committee, Ald. J. Boothman, is service rather than profit. To have completed the compulsory work scheduled in the Extension Order within half the time specified is an indication of the kind of spirit we want in our industry.

Cable Depreciation

THE virtue of overhead lines is that their relative cheapness has made it practicable to supply electricity in places where it would not otherwise have been available, but their use has not always been found expedient. In such cases the cost of cables has been increased by higher depreciation charges than appear to be justified. Their life is assumed to be only twenty-five years—the same as for overhead constructions—and there appears to be no sound engineering reason for the difference between this figure and the forty years allowed for "e.h.p. main transmission lines" as defined in the 1919 Act—in the open country, at any rate; their electrical stresses are usually lower and tapping points are not necessarily more frequent. As distinguished from distributors in urban areas, they are laid in clean soil, are not subject to frequent road openings, and are not drawn into pipes. Surely a much more generous allowance should be made for cables for rural development that have been manufactured, laid and protected in an approved manner, particularly having regard to Mr. P. V. Hunter's view that cables will be used more widely in the future in open country.

Television

THE cathode-ray tube is a prominent feature of this year's exhibition of the Physical Society which was reviewed in our last issue. The application of the principle to television exercises a wide appeal, and it was a good idea of the Television Society (of which Sir Ambrose Fleming is president) to follow up the lessons of the exhibition by a lecture to be held next Wednesday at University College. The practical possibilities of the Ediswan system will be demonstrated, and among other striking features a new development in electrical scanning circuits will be described by Messrs. G. Parr and J. W. Price.



Electrical Drives in a Kettering Shoe Factory (See page 41)

1. Left, a welt-stitch stapler; centre, cold-air chamber; right, 10-division sole-laying air press. 2. A "close-up" of the cold-air drying chamber. 3. The "Excelso" stitching machine. 4. Sole-laying air press with the rough rounder and channeller on the right. 5. The making department. 6. The finishing department, showing the conveyor descending from the upper floor

Tree Values. By R. Rhys Soar, D.Sc.*

The importance of a knowledge of the subject for overhead-line work

WHATEVER system, or lack of system, prevails in the elimination of trees affecting overhead line extensions, much expense could be saved by a working knowledge of tree values. Those halcyon days when nominal sums could be settled out of hand with owners are almost gone; yet even where an arbitrary arrangement may be concluded, the knowledge of what the tree is really worth considerably assists in the preliminary bargaining. Not long ago I read a contribution on wayleave procedure wherein it was dogmatically advised that a fixed sum should previously be decided upon for every tree on the extension, which figure must in no case be adjusted. Apparently a scruffy alder must rank equally with a good oak. This attitude is most unfair, and I suggest that much of the present-day wayleave difficulty is attributable to unequal negotiations in the easy past.

To comply faithfully with statutory requirements when serving formal notice under Section 34 of the 1926 Act on stubborn grantors for the felling and/or lopping of trees, it is required to name the tree(s), and it is obviously necessary to be aware of their commercial value. It is not always an easy matter to distinguish the kinds of trees encountered and I give below their characteristics, ignoring those of no appreciable commercial value.

A tree is measured by girthing and by measuring the length of that part of the tree. For this purpose a special tape (a convenient one can be obtained for 1s. 3d.) is required reading on one side in quarter-girths and on the other in inches and feet. Place the tape around the trunk at a judged average position and book the quarter-girth reading. Then measure and book the length. To find the cubic contents consult the book of Hopper's tables. In the absence of these tables the following formula will assist:

$$\text{Cubic contents} = \frac{\text{Length in feet} \times (\text{quarter-girth in inches})^2}{144}$$

The Cutting Season

I find that where one can converse on tree values on fair equality with the trade it considerably assists in discussions with owners who possess rather exaggerated ideas of what their trees are worth. The prices stated below give a general approximation of the present position, but each tree must be judged on its merits.

The most favourable season for cutting trees is the beginning of winter when the sap is dormant. Both science and tradition agree, for the ancient rules of forestry forbade felling "while the sap was circulating"—*i.e.*, from May to September. The sap, however, is also stationary in mid-summer. In forestry woods should be felled as the trees reach maturity; when the shoots do not lengthen the branches more than the length of the bud there will be no more growth and the wood has attained maturity. Unfortunately trees must come down when and where required, so that many owners, quite justly, claim the value of their trees at full growth and at top market price.

The cross section of an ordinary tree is more or less circular and consists of a number of concentric rings produced annually. The interior is called heartwood, being the best and soundest part; the outer, adjoining the bark, is called sapwood, since the pores still contain the liquid sap. The ascent and descent of this sap forms the annual rings. If the sap is left in after felling, decay will ensue: the process of removing this sap is known as seasoning. Besides the annual rings, in certain trees there are to be seen radiating ties which are known as medullary rays, which are very pronounced in oak and constitute that beautiful marking commonly known as silver grain.

Oak and Elm

Oaks are easily distinguished from other catkin-bearing trees by their fruit (acorns) and their tortuous spreading branches which give a zig-zag appearance. Timber values are 10d. per ft. cube for fair trees, and 1s. 6d. for good trees, up to 2s. 6d. for extra good and large specimens. The ash is characterised by its height, colour, and graceful foliage of four to seven pairs of leaflets which taper on a slender stem. The twigs are greyish in early spring and in winter. The bark is neat, hard and compact.

The genus *ulmus* contains some sixteen species. The common elm is a handsome tree, growing tall, with many branches pendulous at the ends. Its leaves are doubly serrate, rough, and unequally ovate. Elm never fetches a high price commercially. The wych (or Scotch elm) grows tall like the common elm. The branches tend to droop and the bark is smoother than ordinary elm; the leaves taper slightly. The weeping elm is a variety of the wych.

Sycamore, erroneously called the plane tree in Scotland, is stately and perfect as a shading tree which often covers forty yards in diameter. The stem characterises it by its shaley and bluey tint of smooth visible underbark. The sycamore is a species of maple. Within the past few weeks a firm with which I am acquainted sold large sycamores to some Lancashire mills at 2s. 6d. per ft. cube, but small sycamores can be used only for cotton bobbins and fetch no more than 6d. per ft. cube.

The maple is first cousin to the sycamore. It is mostly found in hedgerows, but when in the open rarely rises much over 20 ft. The leaves of the maple are palmately lobed and long stalked.

The horse chestnut has a pyramidal outline with strong spreading branches around a tortuous stem, or trunk, and it has leaves of seven radiating leaflets elongated, and wedge-shaped, which, when young, are downy and droop. The flowers, appearing in May, are white splashed by red and yellow, occasionally recurring in autumn. Spanish or sweet chestnut has wide-spreading branches. Its leaves are large and glossy with toothed margins. The flowers are pendulous; and the catkins yellow and slender. The wood resembles oak but possesses innumerable medullary rays. Unlike oak the wood is more valuable when young than old.

Beech, Birch and Walnut

The beech is one of the largest of English trees, and is characterised by its stubborn, pillarish stem of smooth olive grey bark, rising often to as much as 20 ft. girth. The main branches rise vertically: subsidiary branches spread out; and the general outline of the tree is rounded. Its market value varies from 10d. to 1s. 6d. per ft. cube. The copper beech is a variety of the above; its distinctive feature is due to a red colouring matter in the sap.

The birch is allied to the alder. Medium in size and very hardy, it has a silvery satin-like stem with delicate drooping branches carrying foliage continually in motion. The alder is shrubby, with short-stalked round-like leaves wedge-shaped at base; the wood is soft, white when fresh cut, turning pale red and the knots are mottled and very beautiful. There are over a hundred varieties of willows, which vary from a few feet to a hundred feet in height. The leaves are simple and deciduous, being alternate and usually longer than they are broad. The bark is rugged in the larger trees.

Walnuts are usually large trees with leaves containing aromatic resinous juice; they are unequally pennate and alternately stalked. The hornbeam or yoke elm rises 40-50 ft., and strongly resembles the beech, although its head is rounder and closer. The trunk is flattened and twisted like so many united stems. The bark is smooth and light grey. The leaves are long and elliptically ovate, being doubly toothed, pointed, numerously ribbed, hairy below and opaque and not glossy as the beech leaves. They are long stalked. The fruit resembles that of the chestnut.

There are several kinds of lime tree, all of which have sweet flowers. The wild lime is small leaved. The common lime is cultivated in England and has larger leaves and a smooth grey, tending to faint green, bark. It sometimes reaches a great size.

The poplar—which is an inverted-broom-like and tall tree—has the appearance of a large willow, and at first sight the two are hard to distinguish and the barks are very similar. The poplar, however, has small sparse leaves and its branches protrude more nakedly into space.

Lime and Fir

Firs are differentiated from pines by having their leaves singly on shoots instead of in clusters on a sheath on dwarf branches. The trees are mostly of straight trunk, which tend to conical or pyramidal growth. In spruce firs the cones are pendent when mature, the scales being persistent. The Norway spruce is abundant here and is valued for its timber. This is a lofty tree with a straight tapering trunk. The yew is squatter and more bushy, with dense spreading branches of very dark linear leaves from all sides of the branch. Pines, unlike firs, have hard wood-like cone scales, thickened at the apex. They also have needle-shaped leaves.

The timber values of the above-mentioned trees, unless otherwise stated, if of good quality, vary from 8d. to 1s. per ft. cube. For hedgeline (any tree) the price may be taken as 3d. or 4d. per ft. cube.

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*Dr. Rhys Soar is a member of the staff of the North Wales Power Co.

Electricity in Shoemaking. By Thomas H. Hall

A model works at Kettering

AT the model factory of Dalkeith Shoes, Ltd., Kettering, I recently had the opportunity of seeing electricity employed to the fullest possible extent. The works has a staff of sixty and about 160,000 pairs of men's boots and shoes have been produced in the twelve months that the factory has been in operation; the maximum capacity of the plant is 4,000 pairs per week.

On entering the works I was immediately impressed by the economy of space effected by the layout. A two-storey building houses the plant and on each floor the machines are arranged neatly in two rows by the walls, with a central gangway. Each machine is individually driven by its incorporated motor; the motors range in size from ¼ h.p. to 5 h.p.

Each shoe passes in correct sequence from machine to machine on the roller track conveyor system with which the whole factory is equipped, and which enables a minimum number of shoes to be in the process of making at any one time, resulting in considerable saving of tied-up capital and reducing the number of lasts required.

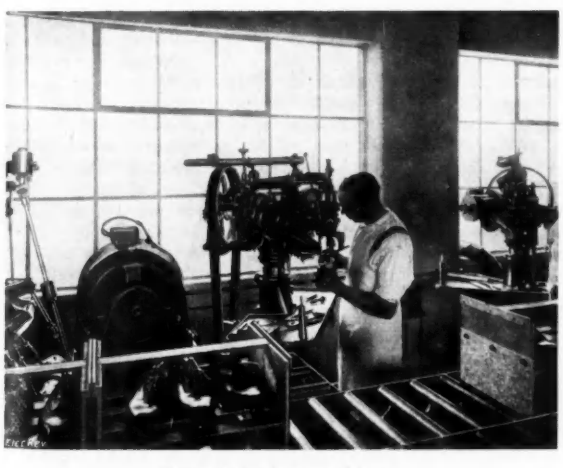
The wiring for the motors is very neat, the main runs being under the floor, with short leads up to the machines, each generally with its "Memrex" controlling switch mounted on it. With the facilities afforded by electricity the company can make and finish welted shoes complete in one day, with a minimum cost per pair for motive power.

The factory commences work with the uppers which are prepared at another works belonging to the company, where, with the aid of patterns, clickers cut the upper leather which is passed on to the closing department where the various parts are machined together and eyelets are inserted.

The Making Room

On the preparation bench the upper is first fitted with a stiffener to determine the shape of the heel and a toe puff to harden the toe. A wooden last with an inner sole attached is then slipped into the upper and determines the shape of the finished shoe. The shoe can now be completed solely by machinery. First, the pulling-over machine pulls the upper over the bottom of the last and drives in tacks to hold it in position. The machine operates with the shoe in full view of the operator at a convenient angle, and the stretch of the upper is made through an oil dash-pot which can be regulated to vary the speed and force of the pull. This is essentially a low-speed machine.

The preparation bench feeds two of these pulling-over machines which each feed two console lasters which insert further tacks to complete the lasting operation and have double raceways for tacks. The shoe then passes to two pounding



Console lasting machines

machines which smooth the seat and sides after the insertion of the tacks, and incorporate a revolving drum composed of steel rings mounted on spindles to which the shoe is held. Three welt stitch staplers are the next machines in the sequence, and they staple the welt to the upper.

It is next necessary to slash the welt round the toe to relieve the tension, and the welt has to be beaten up and the seam levelled. Two combined welt-beating and slashing machines each perform these operations at the same time. A welt-butting machine next tapers the ends of the welt in order that the heel may sit correctly, and the welt waist reducer then removes part of the substance of the welt from the waist of the shoe. The shoe is then ready for the cork filler which introduces cork in the form of paste into the cavity formed by the addition of the welt around the edge of the shoe, and solution is applied to the bottom of the shoe to which the sole will later be attached. The conveyor on which the cases of shoes pass along the room runs through a cold-air chamber to dry the filling and the solution. In this chamber a cold blast is drawn over the shoes by fans driven by a small motor.

A ten-division sole-laying air press next clamps the shoe to the sole and subjects it to an air pressure of 40 lb. per sq. in.

A loose nailer with two motors

This makes the sole conform perfectly to the shape of the last and prevents distortion during the later process of stitching. The air is pumped in and withdrawn automatically by rotating the table from position to position to handle each of the ten shoes which the machine accommodates. Nine shoes are always under pressure, a motor maintaining the suction.

Probably the most interesting equipment in the factory is the rough rounding and channelling machine to which the shoe then passes. This machine trims both the sole and the welt to any desired shape and at the same time cuts a channel which is later to receive stitches. The machine is fitted with twelve Scotch edge cams, so that the operator has no changing or guess work, there being a cam to give him any swell (variation in width of welt) for the outside joint. This machine runs at 550 r.p.m. The channel opener lays back the lip of the channel so cut, in readiness for the stitching process. "Excelso" stitching machines stitch the sole to the welt by means of a waxed thread which passes through molten wax and is prevented from hardening on the machine by an electrically heated head. Stitches are inserted at the rate of 550 per minute. After stitching the channel is closed on a channel closing machine which rubs the channel against a large brass serrated wheel and restores the shape of the edge.

The high-speed loose nailer, which attaches the seat of the sole to the shoe and at the same time cuts away surplus material, has two electric motors, a high-speed one to drive the knife, the other inserting the rivets. The shoe is then put to the welt wheeler which separates the stitches. The automatic rotary twin sole leveller, by rotating rollers, levels and forms the outside to the contours of the last. When driven from shafting this machine requires a 4-in. belt, but with the introduction of the unit drive it is successfully operated by two V belts. It has a capacity of 1,000 pairs per day. The shoe is then ready to descend to the finishing department, but the conveyor first passes through a sole-drying chamber fitted with fans and electrical heating elements.

The Finishing Department

Here forepart parers first smooth the edges of the forepart of the sole. A hood receives the leather dust and a strong suction from the central dust-removing system takes it away from the cutter. Referring to the webbing drive, Mr. Shorley, manager of the factory, told me that a smooth high-speed drive is required and with shafting large pulleys are always employed. With the unit drive webbing belt can be used, reducing the vibration on the machine.

An outside heel attacher nails the heel to the shoe. Several nails are driven in at one operation and clenched on the last inside, the shoe going through all the operations without the last being removed, thus retaining its shape perfectly. Here, again, unit drive enables two V belts to be employed where

normally a 3-in. leather belt would be essential. Slugging machines drive nails into the back of the heel, the nails being in the form of a coil of wire which is driven in and cut off at the surface of the leather. As these two machines are not required at the same time, only one is fitted with an electric motor, the other being mounted with a separate belt which can be put over to the motor.

Heavy paring is often necessary, and the heel-paring machine incorporates a heavy but accurately balanced flywheel on the cutter shaft to withstand shock loads. The knives run at 6,000 r.p.m. and the heavy pulleys enable V belts to be used. On the twin breast scouring machine for the fronts of the heels the operator can watch the edge that he is scouring, and so damage to the corner is avoided. The heels are finally smoothed on either a four-roller or a two-roller scouring machine, the leather dust being removed by the central extracting system.

The edges and heels of the shoe are next inked and placed in a cold drying chamber fitted with fans, and on emerging it passes to the hot-wax heel-finishing machine and then it is padded and brushed. To an electrically heated roller wax is applied and transferred after melting to the waxing roller. The heated pad is flexible and adapts itself to any reasonable variation in the shape of heels. Electrical heating has facilitated this part of the production considerably by reason of its cleanliness and efficiency.

Two-roller bottom scourers next remove the grain from the sole and smooth it. Each machine has an automatically oiled oscillating movement, the bottom of the shoe being applied to a revolving roller which also moves sideways. A hot-wax bottom-finishing machine with electrical heating next conducts a similar operation to that of the hot wax heel-finishing machine, and a brushing machine fitted with revolving leather rollers and brushes polishes the heels, top-pieces, waists and bottoms, and the edgesetter sets the edge of the sole and welt by an electrically heated iron, while a brushing machine finally polishes the ink.

A machine designed to reproduce the hand operation as closely as possible then slips the shoe from the last. The operator cuts the lacing thread on the stationary knife, drops the last on the last peg, and by a foot treadle switch puts the motor in action. At the same time he presses down the forepart of the shoe. By an ingenious arrangement of levers combined with a novel application of the motive power the rubber pad grips the heel portion of the upper and pushes it off the last as the operator, by pressure of the hand on the forepart of the shoe, breaks the last and draws the shoe forward. Pressure is actually made through an oil compression device. The finished shoe is then ready for packing.

In connection with the fitting of the motors to the individual machines, each machine has had to be studied with regard to its adaptability, and special motor bases or brackets were designed to suit the particular circumstances. In some cases, such as the console lasting machine and the welt stitch stapler, the construction of the base of the machine has been modified to accommodate the motor. A considerable amount of research in this connection has been undertaken by the Standard Engineering Co., Ltd., which manufactured and installed the whole of the plant.

Advantages of the System

The economy achieved in such an all-electric factory is instanced by the fact that the total h.p. of the motors installed is 63, and only 23 h.p. is used at any one time. This includes the 10-h.p. motor which drives the fans of the central dust extractor. Motors manufactured by the British Thomson-Houston Co., Ltd., are exclusively employed.

Mr. William Rock, a director of the Standard Engineering Co., informed me that the system of unit driving combined with the added efficiency resulting from the use of the conveyor system has tremendous advantages over the old system of shafting, and that this is the only factory in the country to employ both the unit drive and the conveyor system. The saving in power is colossal, and in this particular instance could not be fully realised until the factory was actually in operation.

There are approximately sixty motors installed at an average cost of £8 each, including the cost of fixing. Allowing about £200 for the wiring of the factory the total expenditure was £680. The alternative method would have necessitated four rows of shafting driven by at least four 10-h.p. motors. When the cost of such shafting is calculated together with the cost of the long and expensive belting, the unit drive system is found to be definitely cheaper.

The Domestic Tariff. By H. Corner

A SUITABLE two-part domestic tariff that represents accurately the cost of providing domestic supply is needed. The methods at present in vogue to determine the fixed-charge portion of domestic two-part tariffs, *viz.*, percentage on rateable value, number of assessable rooms, and even the recommendation of the Electricity Commissioners' Committee, floor area, are essentially unsatisfactory because they bear only a vague relationship to electrical demand.

When determining the amount of the fixed charge, engineers have been far more concerned with relating it to the amount previously obtained for lighting than to the domestic heating demand. Such bases are likely to remain in use for some time to come as no more fundamental method of equitably determining domestic electrical demand seems immediately feasible.

Adapting the Existing Fixed Charge

But can the present fixed charge be so adjusted that it bears a little closer relationship to fundamentals and, at the same time, act as an incentive to the consumer to install, in particular, a cooker and a water heater? The suggestion which I put forward may be of assistance.

In the following table the figures are only intended as illustrative as they are obviously lower than those rates which can be offered at present by the great majority of undertakings.

Fixed charge (four assessed rooms) = 30s. per annum.
Deduct for cost of metering (interest and depreciation on meters, repairs, cost of rendering accounts, &c.) = 5s. per annum.
Rebatable portion of fixed charge = 25s. per annum.

Rebates.

(1) 10s. p.a. for cooker or water heater installed and consumption of 1,000 kWh p.a.
(2) 20s. p.a. for cooker and water heater installed and consumption of 2,000 kWh p.a.
(3) 25s. p.a. for cooker and water heater and radiators, &c., installed and consumption of 4,000 kWh p.a.
(A rebate of 10s. p.a. for a consumption of 1,000 kWh p.a. is at the rate of ½d. per kWh.)

The size of house is no criterion of either electrical demand or consumption, whereas the installation of a cooker and/or a water heater does afford a fair standard of comparison not only to the engineer but, no less important, to the consumer, particularly if he has neither. By such a scale he would be induced to use electricity for heating purposes other than by luminous radiators.

The consumption necessary to entitle a consumer to his rebate has been kept low to avoid the obvious "hard cases," though generally a cooker consumption of much more than 1,000 kWh p.a. would be obtained from the average family, and similarly with the water heater.

If the secondary charge of the tariff were ½d. per kWh, under (1) and (2) in the preceding table the revenue per kWh for the first and second thousand kWh would only be ½d., but this would more than cover the whole of the working costs of the more efficient undertakings. In each instance hundreds of additional kWh would be sold at ½d., and many additional consumers might be obtained, greatly increasing the undertaking's output and load factor and reducing the costs of supply (both capital and working) so that on balance the loss of ½d. per kWh for the first and second thousand of each consumer's consumption might be of no consequence.

If the idea underlying my suggestion has any merit this is more important than the applicability of the given figures to individual undertakings. It may be urged that under existing schemes a consumer can effectively "rebate" the fixed charge by the simple device of using electricity either with a cooker or a water heater. So he can, but at present he usually secures the rebate by the use of luminous radiators only, a type of load which engineers look upon with misgivings because of their possible effect on the peak, particularly in undertakings which take a bulk supply.

A More Desirable Load

There is nothing in my suggestion which can prevent this, and it is no part of my intention to deter consumers from using electricity for any purpose. My endeavour is to provide load to compensate in a positive degree for the inconvenient radiator load. The third rebate is not an essential part of the scheme. The allowance per kWh has been made very small, and would be gained only by those consumers who, in a small house, had used electricity to a considerable extent.

A consumer might get all three rebates chiefly from the use of electricity for radiators, even though he had both cooker and water heater installed, especially if he lived in an oldish house and relied on the kitchen range during the winter for cooking and water heating. I would stress that my purpose is not so much to get a cooker and water heater installed in every house, as to attempt to put on to a better basis the assessment of the fixed-charge portion of domestic two-part tariffs—until such time as a really equitable tariff is devised.

Electrical Instrument Progress. By A. C. Jolley, A.M.I.E.E., F.Inst.P.

The 24th annual exhibition of the Physical Society

IT is only those of us who can remember the early exhibitions of the Physical and Optical Societies who can really appreciate the growth, the wide range now covered, and, above all, the enormous improvement in the instruments exhibited this year at the twenty-fourth exhibition, and, after a somewhat rapid tour of the stands, one is left with the general impression that the British instrument makers can easily hold their own with those of any other country in the world.

It was also interesting to notice that the manufacturers seemed to have acquired a spirit of ceaseless activity, so that, despite the great depression of recent times, progress and improvement in British instruments has gone on quite steadily. Although there were no very spectacular innovations this year, most of the exhibitors had something which was shown for the first time.

In part, the exhibition itself can claim some credit for this, for it has become one of the most important instrument exhibitions of the year, and serves as a definite date to which manufacturers work to complete some new apparatus. The perfect instrument is, however, evolved very slowly, and only those intimately acquainted with instrument manufacture can appreciate the amount of intricate detailed difficulty which has to be faced and overcome before an instrument can be put on the market.

Two views of the Physical Society's Exhibition held at South Kensington this week

Better Finish

One outstanding feature of this year's exhibition was the steady improvement in both the external and *internal* finish of most of the instruments displayed. One noted that the fancy finishes of a few years ago are giving place to plain, durable, and more dignifying finishes. This is particularly the case with the coarse crystalline enamel finish which was in such favour a year or two ago. One always felt that it was used to hide a multitude of defects, and in practice it became a dust trap which very soon gave the instrument a shabby and untidy appearance. A much finer grain is being adopted now, and we shall probably see the complete abandonment of the crystalline surface in the near future for all but the cheapest of instruments.

The large slabs of polished ebonite that we had occasion to remark upon a year or two ago have disappeared, and we now look forward to the time when golden lacquered brass will give place to a more durable metal finish.

The indicating instruments shown were excellently constructed; the internal finish, scaling, and treatment of the dial plate showed excellent workmanship. The fashion for miniature indicating instruments still holds the field, and every exhibitor of indicating instruments offered wide ranges of this type of instrument both as single instruments or as compact testing sets for a.c. or d.c. measurements; and one is forced to admire the exquisite workmanship which is put into most of them.

There also seems to be a tendency for a more general adoption of the recording instrument of the intermittent type where a timed mechanism causes the pointer to automatically record its position by a dot. It is only reasonable that this should be so, for in order to overcome chart friction and to provide sufficient length of pen arm in the original direct writers, the movement of the instrument had to be designed in such a way as to necessitate considerable sacrifice of accuracy. With the dotting recorder the normal form of movement may be used whose pointer has unimpeded motion except at the moment of making the record. The instrument therefore takes less power and is free from the messiness of a fluid ink.

Another feature of this year's exhibition was the popularity of the cathode-ray oscillograph. Several sealed gas tube equipments were shown. These equipments are characterised by their compact and robust nature, and the simplicity of their operation, and as the tube is mounted on the plug socket plan it can be easily replaced when necessary. The time sweep is in all cases valve operated and excellent stationary records can be obtained.

It would therefore not seem unlikely that such equipments will eventually supersede the electromagnetic type in a great deal of work carried out at power frequencies for with the dual-wave arrangement that Standard Telephones & Cables, Ltd., have introduced with their equipment this year one of the principal objections to its use for this work has been removed, while simultaneously the same oscillograph equipment is available for work at audio frequencies. A fine example of the all-metal cold-cathode-ray oscillograph was exhibited by the Cambridge Instrument Co., a unique feature of this beautiful research instrument being that it could easily be modified by substitution of one of its sections for electron diffraction work.

The use of the dry rectifier in conjunction with the moving-coil instrument has opened up a number of possibilities in electrical measurement. One of these which is particularly noticeable this year is the return to the alternator type of speed indicator. The advantage of having all windings stationary, the absence of commutation and contact troubles and the great compactness with which it is possible to build the machine make this type of indicator very desirable, and the rectifier-operated instrument removes the last objection to its use.

Photo-electric Cell Applications

The photo-electric cell applied to photometry, to the maintenance of constant room temperature, to the comparison of the reflecting power of surfaces, to the testing of blood, to the control of a transmitting system, and as a photographic exposure meter, were all exhibited and indicate the wide field in which this valuable piece of apparatus is now finding use.

There were several excellent examples of the heterodyne oscillator with a wide range of frequencies shown, a fine example being exhibited by Messrs. H. W. Sullivan, Ltd., with a range of 0 to 12,000 cycles per sec. obtained with a single sweep of the condenser. The high stability of beat frequency is obtained by the use of dynatron oscillators in which the tuned circuits are made up with the well-known Sullivan-Griffiths thermal compensated inductances and air and mica condensers of high quality. In this way a logarithmic scale of frequency of 0.2 per cent. accuracy is obtained. The hourly stability of the oscillator is 0.3 cycle per sec. and the daily stability 1 cycle per sec. Pure output up to 2 W is obtained, and the output voltage over the whole range is constant to 0.1 decibel.

Some very fine examples of fork- and crystal-controlled frequency standards were also to be seen.

Multi-speed Motors. By F. Harrabin, M.Sc., A.M.I.E.E.

Consequent-pole connections for a.c. supplies

SPEED variation with d.c. motors is readily accomplished by means of shunt field regulation; the field is weakened and the machine speeds up. This arrangement gives a practically constant speed between no load and full load for any one setting of the regulator, unless there is an appreciable drop in the armature circuit, which may occur with small machines. Changes in the temperature of the windings also affect the speed; if the speed be set when the machine is started from cold, there will be a noticeable variation from the original speed after the machine has warmed up.

[*Whitlock & Sons, Ltd.*

Mr. F. Harrabin is a graduate of Leeds University, and has been chief assistant engineer to Messrs. Higgs Motors, Ltd., for the past seven years

With a.c. supplies the problem of speed variation, particularly as applied to motors up to 10 h.p., is not so readily solved. The slip-ring induction motor with rotor-resistance control becomes rather inefficient for large speed variations and has the further disadvantage that the no-load and full-load speeds are widely different for a given regulator setting. The a.c. commutator motor with a shunt characteristic calls for a commutator of large diameter in addition to somewhat elaborate brushgear. By gradual movement of the brushes around the commutator a range of speeds having infinitely small steps is obtained. If remote or automatic control of speed is desired, the use of an auxiliary motor to rotate the brushgear becomes necessary and the equipment is too expensive for small powers.

Provided a maximum of three or four different speeds is sufficient the multi-speed squirrel-cage induction motor is generally most suitable. This type of machine operates by changing the number of poles, each different arrangement of the poles giving a different speed. The squirrel-cage rotor readily accommodates itself to any number of poles, but the stator winding requires special attention. It can be arranged with a separate and distinct winding for each different speed or use may be made of the consequent pole type of winding.

For the former, each winding is designed and proportioned for its particular horse-power and speed, and is entirely independent of the windings and outputs at the other speeds. This method gives complete freedom as regards the possible outputs at the various speeds but wastes space when more than two speeds are required. A four-speed machine, for instance, with four separate windings, makes effective use of approximately only one quarter of the total stator winding at any one speed.

The consequent pole winding on the other hand can be used for two separate speeds—one of which must be twice the other.

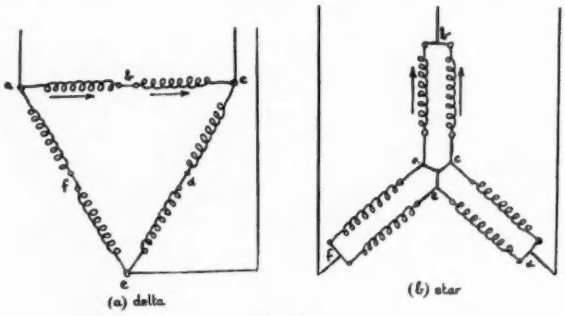


Fig. 2

By a simple reconnection the direction of the current in one half of the winding is reversed with respect to that in the other half. In fig. 1 (*a*) when current enters at B and passes out at C, four poles are produced, *i.e.*, two north and two south poles arranged in the proper sequence. On joining B and C together and feeding in at A, the current leaving at B and C, four south poles are formed on the cores which carry the coils; the flux from these passes into the yoke and down the four cores without windings, making these into north poles by induction and so subjecting the rotor to the influence of eight poles, as indicated in fig. 1 (*b*).

Fig. 2 shows the method of reconnecting a three-phase winding. The whole winding forms a closed ring, which, when tapped at three points, *a*, *c* and *e*, gives a delta connection. In fig. 2 (*b*) a rearranged star connection is shown, with two halves of each phase in parallel. The arrows show the directions of the current in one phase, and indicate that a change from one connection to the other involves a reversal of current in one half phase with respect to the direction of current in the other half phase. Thus the number of poles can be changed, one connection giving twice as many as the other. Although the salient pole arrangement indicated in fig. 1 would produce a rather abnormal field shape, the field given by a non-salient pole type of winding, distributed over a number of slots, is quite usual.

A four-speed machine would have two windings each capable of reconnection and giving two speeds per winding. With these machines the ring connection on the winding not in use must be opened, otherwise a closed circuit is offered to the e.m.f. set up by transformer action with the winding connected to the supply, which would result in a partial short-circuit.

The use of one winding for two speeds definitely limits the ratio of the outputs at those two speeds. If the arrangement of the half phases is such that the star connection forms the larger number of poles, the winding is suitable for giving the same horse-power at both speeds. A power which increases in proportion to the speed, *i.e.*, constant torque, can be obtained when the delta connection gives the larger number of poles.

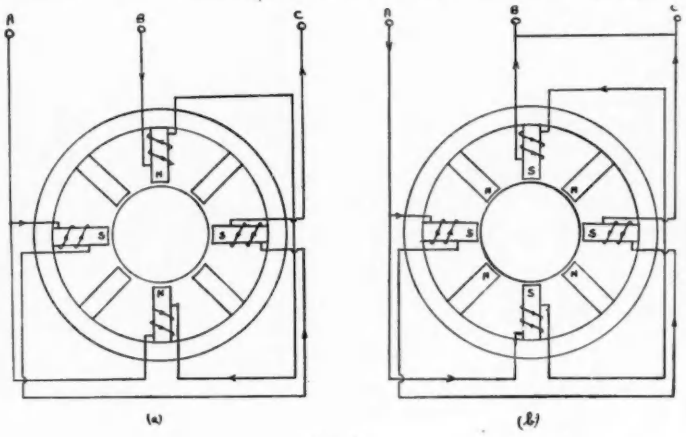


Fig. 1

As the full load currents are not the same at the various speeds, different overload releases are necessary for each speed. When used in conjunction with machine tools, push-button and limit-switch control may be required. Complete protection, together with ease of control from any number of separate points, can then be obtained with contactor gear having overload releases on each set of contactors. Another means of control which is available is the use of non-automatic drum-type switches.

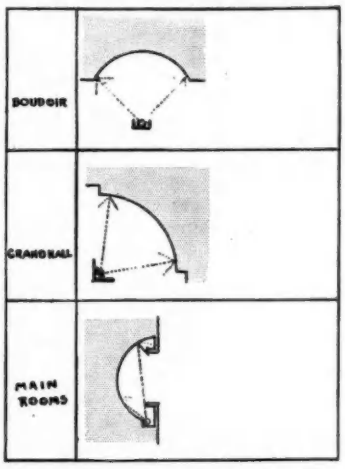
If the supply regulations will not permit direct starting, an auto-transformer must be employed in addition to the necessary pole-changing switch, but, as an increasing number of undertakings permit machines up to 3 or 5 h.p., or even higher, being directly switched on to the lines, this will rarely be necessary.

Television in Germany

An ambitious programme of television development has been planned by the German Government and the Reichspost. According to *Hamburger Nachrichten*, about twenty short-wave transmitters will be erected in the near future, the existing experimental plant in Berlin being already under reconstruction, with the addition of a 6-metre transmitter. It is hoped to commence regular transmission in April next. A transmitter will then be erected at Hamburg, provided that sufficient promise of support is forthcoming from the public. A Television Association has been formed at Hamburg.

Domestic Architectural Lighting

WHEN one hears of a new building being constructed to the designs of Monsieur R. Mallet-Stevens, the architect, one is always certain that there will be something different about it. Just outside of Roubaix, M. Mallet-Stevens has constructed a villa, and M. André Salomon was called in to design and install the lighting arrangements as an integral part of the decorations.



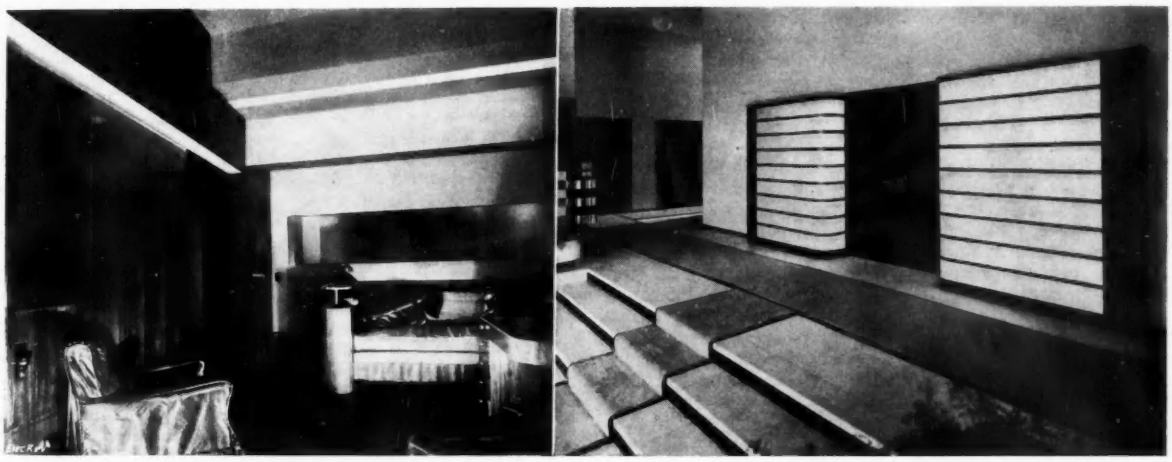
The methods of mounting the lamps in cornices, &c.

The installation itself consists of circuits centralised on a single board on which are installed circuit-breakers, distant control interruptors, and other control devices. The switchboard is of black bakelite sunk into a cabinet in the wall of the entrance hall. All the circuits from the switchboard end in branch fuse boxes in the various rooms. The connections of the lighting points, switches, plugs, &c., run from these fuse boxes, which also contain secondary branches. In this way the installation was carried out without splicing the wires, all of which run in steel conduit throughout, providing security and accessibility. The steel conduit is hidden in the walls.

The lighting of each room is the result of special study and almost all of it is indirect. It is, in general, localised on reflector surfaces of constant brilliancy. These surfaces are cylindrical and are painted matt white. The lamps are placed as indicated by the accompanying sketches, the brilliancy of the surfaces thus being rendered uniform. Naturally, the size and diameter of the reflectors vary from room to room. In one room, however, the light is cast at an angle on to a flat surface. In the smoking-room variety has been introduced by placing tubular lamps in niches in the walls, thus giving the effect of an open window. In the kitchen, pantry, scullery, &c., the lighting is by glass spheres, while in the entrance hall the light comes through opal glass panels and from metal wall brackets.

Other Electrical Features

There are numerous plugs in the different rooms, permitting the use of such portable apparatus as vacuum cleaners. Besides these are electric washers, dryers, calenders, refrigerator, a lift and dumb waiter, which are installed permanently. Altogether there are nineteen telephones in different rooms for communication both inside the house and outside. Ten radio loud speakers are connected to a radiogramophone in the living room, while rheostats and switches in each room control the volume, or open or close the central radio circuit. Three loud speakers in the living room are acoustically arranged to give the impression of an orchestra. Twenty electric dials relay the time to each room from a central clock.—S. H. KAHN (Paris).



Some of the lighting in a Roubaix villa: Left, the living room. Right, the extensive opal panelling in the hall

Calculating Three-phase Power Factor

THE calculation of the approximate power factor of a three-phase load from wattmeter readings is a favourite problem of the elementary text books on a.c. theory. The ordinary formula, depending upon the sum and difference of the wattmeter readings is not very convenient for practical use, as, not only does it lead to the tangent of the circuit phase angle, but, requiring a sum and a difference, it calls for some preliminary calculation before the slide rule can be used. The formula in the text books, which derives the actual power factor from the ratio of the two wattmeter readings, is somewhat formidable in appearance, but can be adapted for slide rule use without the necessity for any other calculation if the simple device of marking a temporary reference point on the rule be allowed. As power-factor calculations are necessarily of an approximate character, such a mark can be made with a pencil so that it can easily be erased.

The ordinary formula as found in the books is

$$\cos\phi = \frac{m+1}{2\sqrt{(m^2-m+1)}}$$

where m is the ratio of the greater to the smaller wattmeter reading. This ratio can evidently be obtained on the slide rule without the necessity of recording the readings on paper. Let the above formula be restated in the following way:—

$$\sec\phi = \frac{2\sqrt{[m(m-1)+1]}}{m+1}$$

then, if sec ϕ be determined on the lower scales of the slide rule, cos ϕ can be read straight off without resetting the rule.

To apply the formula, the value of m is obtained in the usual way on the upper scale of the rule, and is marked on it in pencil; m is now multiplied by $(m-1)$ the value being read off by inspection of the rule. This product being marked by the cursor, the end of the slide is placed to a point corresponding to 1 in excess of the product. The end of the slide will now give $\sqrt{(m^2-m+1)}$ on the bottom scale of the rule. Multiplying by 2 on the lower scales with the same setting of the slide, and dividing by $(m+1)$, the value of which is read off by inspection of the reference mark, the end of the slide will give sec ϕ on the bottom scale of the rule, while the value of cos ϕ (the power factor) will be indicated on the bottom scale of the slide against the end of the scale on the rule.

To give a numerical example: suppose that the two wattmeter readings are 966 and 259. The ratio of these readings is found on the upper scales of the rule to be 3.74, and this point is marked. 3.74 is then multiplied by 2.74, and the 1 of the slide is advanced to this product plus unity, giving 1,120 on the top scale of the rule, and 3.34 as the value of the square root on the bottom scale. Multiplying by 2 on the bottom scale and dividing by 4.74, the value of $(m+1)$, read off from the reference mark on the top scale, the value of the power factor, 0.707, is read off on the lower scale of the slide against the end of the scale on the rule.

As the fundamental formula is not easy to remember, this method of calculation is not so suitable for occasional use as it is if rapid field calculations of three-phase power factor have to be carried out frequently.—G. W. STUBBINGS, B.Sc.

Textile Electrification. By F. B. Holt

Modern practice in Great Britain and Germany

A VALUABLE addition to the literature relating to the application of electricity to textile manufacture is the work by Dr. Wilhelm Stiel, entitled "Textile Electrification" in its English translation by A. F. Rodger (George Routledge & Sons, 3 gns.). The book deals not only with the old-established processes of cotton and woollen manufacture, but also with the less commonly discussed embroidery and finishing work and rayon, jute, flax, and rope. Each section is covered in its theoretical and practical aspects.

Following on a short historical survey, the main work is divided into three sections, dealing with the supply and distribution of energy inside the mill, with motor drives, and with auxiliary applications. Criticism of this excellent work may be made on two main grounds: first, the author's views are sometimes based upon the ideals of maximum production and highest quality without sufficient regard for economic considerations; secondly, his descriptions and recommendations are based on Continental practice and are not directly applicable to conditions in this country and America.

Dr. Stiel states that a mill equipped with its own generating plant should have a standby plant, or, alternatively, use the public supply as a standby. For the rayon industry, and the chemical sections in general, I would agree with this view, but for general work in cotton, woollen, linen, and jute manufacture the provision of a standby is often not economical.

Public and Private Supply

Data is given on the parallel use of private generating plants and public supply in factories and mills requiring heat energy in the form of steam and hot water, on which lines several successful schemes are operating on the Continent, but which are not applicable to this country without a complete reorganisation of the industry. Dr. Stiel states that power plant for the textile mills should be installed solely from the production point of view, *i.e.*, implying a disregard of plant costs, but the increase in capital charges due to the adoption of more up-to-date methods of driving might easily counterbalance the profits obtained by greater production. Graphs illustrate speed variation of lineshafts due to loads and show how the irregularity increases the farther the load is away from the prime mover; some good arguments are given for individual drive.

The author is very sweeping in his remarks on the use of ball and roller bearing lineshafts, but there are many cases where the individual drive is not sound economically, and improvements can undoubtedly be made by using ball and roller bearing lineshafts, of which there are many examples in this country. The author is much too emphatic in his preference for built-in geared-motor units. Equally efficient, and in many cases better, drives are to be obtained by using the standard squirrel-cage motor and chain drive, or even the vee-rope drive. In my opinion, the built-in geared motor is an objectionable piece of apparatus; there is always the danger of oil leaking into the motor windings, and the gears are inaccessible. A much better system is to make a self-contained gear box with a flange-mounting motor bolted to it.

The author states that synchronous, compensated and allied types of motors are complicated and sensitive; he discourages their use, and affirms that the ordinary squirrel-cage induction motor is still the simplest and best type. In view of these remarks, one is surprised to see throughout the book emphatic statements that three-phase commutator motors should be used for practically every application.

I am very pleased indeed to see the author advocating simple starting gear forming a combined unit with the motor, which has been adopted in England for many years. I agree with him that the motor should not be stopped for a temporary overload, but I do not agree that a simple switch and fuse is adequate protection, as there is a positive danger to the operative in the event of a stoppage due to temporary interruption of supply, in that the machine restarts when the supply is resumed. For this reason, I am convinced that the best and simplest safe type of control gear for the squirrel-cage motor is the direct-on-line starter with thermal relays and no-volt release.

Blow-room Machinery

As the blow-room is probably the most important section of a cotton-spinning mill, I should have expected the author to have gone into its electrical equipment more thoroughly, particularly as there have been during these last few years more developments in opening and blow-room machinery, and its electrical control, than in any other section of the mill. Unless the material produced in this department is of the best, there will be faults which no electrical control of the machinery in other sections will rectify.

The 116 pages dealing with ring and mule spinning are probably the most thorough and instructive that have ever been published. From theoretical considerations only, Dr. Stiel shows that a spinning frame which can have its basic and layer speed varied when building the cop should produce more and better yarns. Regarding carding engine drives, there appear to be no rules in Germany safeguarding the operative as, for instance, there are in England, to the effect that there must be an interlock between the cylinder drive and the stripper door. This rule makes the individual drive of a carding engine more complicated, with the result that the method has not been adopted extensively here.

The Criterion of Efficiency

The treatment of the individual drive of ring spinning frames and mules can safely be said, also, to be the most comprehensive yet published. Dr. Stiel shows again, by theoretical considerations only, that increased production and better yarns can be obtained with a ring spinning frame driven by a three-phase shunt-type variable-speed commutator motor with automatic regulator in which the basic and layer speed is varied when building up the cop. He claims that by using this type of motor with spinning regulator, production is increased by 20 per cent. over that of the frame driven by belt from a lineshaft at constant speed.

Unfortunately, this is not so in practice, and extravagant claims regarding production made by electrical engineers tend to retard the use of electricity in the Lancashire textile industry. Electrical engineers ought to realise that the production of a mill is governed by the number of spinning spindles or looms which can be accommodated on a given floor area. All other machines, including the driving arrangements, are only means of preparing the material for the final operation of spinning and weaving, on which the production, and hence the profits, of the mill are judged.

For instance, if on a given floor area accommodating 40,000 spindles variable-speed commutator motors were substituted for constant-speed squirrel-cage motors for driving the frames, then, owing to the increased floor area required by the former, the spindleage would have to be reduced by a minimum of 4 per cent., *i.e.*, by 1,600 spindles. Further, the cost of a commutator motor with complete equipment for a 440-spindle frame is about £125, whereas a squirrel-cage motor of equiva'ent horse-power, with driving arrangements, would cost only £34. Now the average efficiency of a commutator motor on variable load is between 7 per cent. and 10 per cent. less than that of the corresponding squirrel-cage motor; therefore, when due allowance has been made for capital expenditure and increased power cost, and taking into account the oncost per pound of yarn produced to cover these two items only, the use of a commutator type of motor is not a paying proposition.

Speed Regulation

Diagrams are given that show the maximum increase of production with different methods of speed regulation to be 20 per cent. under very special conditions. Let us assume that in practice the best that can be hoped for is an average of 10 to 12 per cent. over constant-speed drive with squirrel-cage motors—a value that is reduced by the increased space occupied by the commutator motor to about 8 per cent. The new developments in ring frames—especially the new weft ring frame by Platt Bros. with movable lappet eye rising and falling with the ring rail—and the increased angle of the roller stand, which always maintains a constant length of yarn from the lappet eye to the traveller, will reduce still further the advantages claimed for the variable-speed commutator motor.

I am in no doubt that the only satisfactory way to drive a mule is by a specially designed squirrel-cage motor. The author advocates the gear drive and slipping clutch for all types of looms, irrespective of whether they are of the fast or loose reed type. This we know is old Continental practice, but it is obviously not correct. The author does not favour chain drives for looms, and states that they do not run as smoothly as gear drives and are expensive. This is not so; the chain drive is considerably cheaper, and has the further advantage of being lighter, resulting in less strain on the loom when stopping. No mention is made of the vee-rope drive for looms, which has proved so satisfactory in recent years.

There is scarcely a page of this work that is not brimful of useful information, and there are copious references to patents and other publications. The volume is excellently illustrated, printed and bound, and I predict for it a safe position among authoritative works of reference. It should certainly be in the hands of all concerned either with textile manufacture or the design of electrical apparatus therefor.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Transmission-line Travelling Waves

THE two papers on the influence of associated apparatus on transmission-line travelling waves and the high-speed recording of such waves by cathode-ray oscillograph, by Dr. J. L. Miller and Mr. J. E. L. Robinson, which were referred to last week, were discussed at the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 4th.

Mr. B. L. Goodlet described the principal paper as thorough, but did not think it revealed anything that was not known. It was very educational, though the author seemed to have been carried away by the mathematics of the subject. The function of mathematics in such a case as this was not to predict, but to provide numerical examples. Therefore, some of the predictions must be accepted with caution in the absence of confirmation. He (Mr. Goodlet) treated all transients as uncontrolled, and for really high voltages preferred the resistance potentiometer to the condenser type.

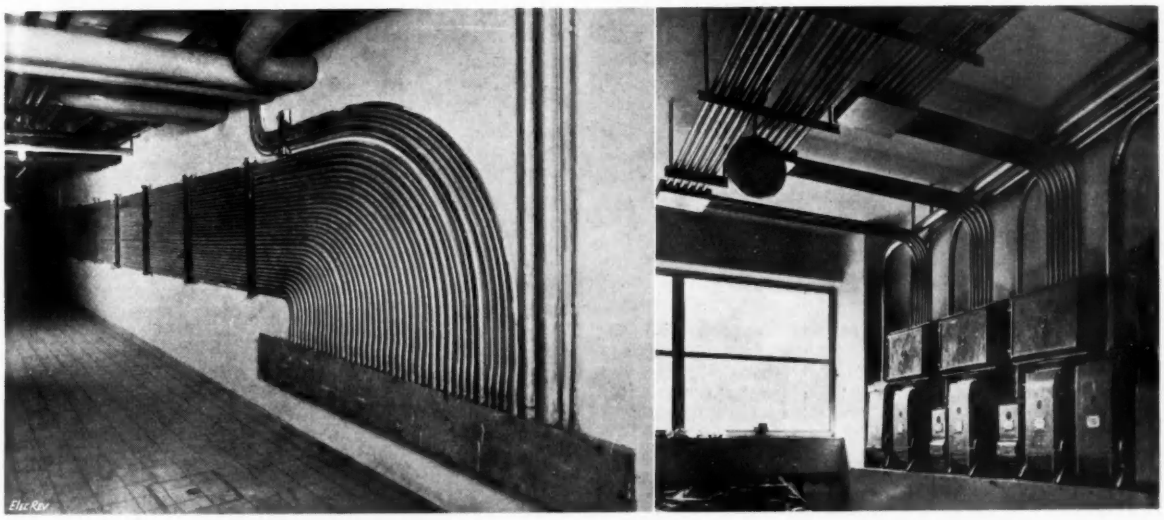
Mr. R. A. Watson-Watt suggested that the authors had not mentioned some of the disadvantages of the gasfilled discharge tube. He was surprised to hear Mr. Goodlet say that mathematics should be used historically and not for forecasting. The stage had been reached at which difficulty was encountered because the shape of a lightning wave at the origin was unknown. At present they only dealt with the effect produced, but the real shape of a lightning time wave would have to be ascertained before long. Prof. J. T. McGregor-Morris suggested that the time had arrived for the standardisation of oscillograms, and that the authors had been too kind to the sealed-off oscillograph. He asked for more details about its construction and the relation between beam intensity and photographic action. Only about 2.5 per cent. of the energy put into the tube reached the photographic plate.

Reliability of the Grid

Mr. V. Z. de Ferranti said that the authors had acquitted themselves very well. They did not represent the British section of an international organisation, and had no one to fall back upon. Their investigations should ultimately cheapen electricity, for unless the national grid could be made absolutely reliable it would not be possible to achieve the basic aim of shutting down so-called surplus plant. Prof. G. W. O. Howe commented on the great progress that was being made with sealed-off oscillographs. An astonishing amount of light was obtainable for external photography, and the speed of the beam spot was remarkable.

Lieut.-Col. A. G. Lee said he was disappointed in the paper, as he had failed to find anything in it which would tell him how to protect lines against lightning. The method of attack was not indicated, but only the results which followed. High radio aerial masts seemed to drain the atmosphere above them and so reduced lightning. Therefore it would seem that good earthing was of importance. One way of reducing steep wave fronts might be to convert the line into a sort of low-pass filter. Dr. E. H. Rayner observed that a great advantage of modern oscillography was the ability to see what was happening and to make precise adjustments before the photograph was taken. Slow plates were not so easily fogged as fast ones. He asked for more information about the authors' oscillograph, and whether they had tried timing devices which did not use spark gaps. Mr. E. T. Norris said that a very important use of the high-speed oscillograph would be for determining the constants of line components. For instance, the 50-cycle inductance and d.c. resistance of a choke coil could be ascertained, but such values would be most difficult to calculate under surge conditions.

Mr. J. E. L. Robinson's brief reply was supplemented by Dr. Miller, who remarked that they *used* mathematics and had not included them merely for ornament. If they could enjoy the co-operation of power undertakings, someone might some day lend them a sub-station wherewith to confirm the predictions.



Examples of neat conduit work at the Royal Masonic Hospital, Ravenscourt Park. **(See page 49)**

Electric Power Development in China

IN spite of all that has happened in recent years, China has progressed generally, said Mr. A. J. Percival, managing director of Inniss & Riddle (China), Ltd., in his address as chairman of the China Centre of the INSTITUTION OF ELECTRICAL ENGINEERS, at the annual dinner on November 23rd at the Shanghai Club.

As regards the progress of electrical development no reasonable doubt can exist. Until the present form of government began in Nanking six years ago, practically no attempt had been made to regulate or guide electrical development. Three years ago the National Reconstruction Commission issued technical regulations for Chinese electricity supply utilities. The standard frequency adopted is 50 cycles with standard voltages perhaps nearer the American. It has also issued rules for the registration of electricity supply companies, for indoor and outdoor wiring, and regulations concerning the theft of electric current, while an annual statistical investigation of electric power plant was commenced by the Commission three years ago.

The regulations allow of 10 per cent. difference between actual and declared voltages. Yet in the average Chinese city at night the actual variation must be anything up to 40 per cent., at all events on lighting circuits. To-day in China undue emphasis is very apt to be laid on efficiency of generation, to the neglect of efficiency in distribution. Standardisation of frequency is a most important national matter, which the Commission is quietly doing its utmost to bring about. The Hong Kong Government has shown the way in the last three years by changing the frequency at Kowloon and in the Leased Territories to that of Hong Kong itself—50 cycles per second.

Higher Standards Needed

It is particularly desirable that better standards for the insulation of wire and cables, switchgear, and small apparatus should be adopted at the earliest possible moment, because of the excessive loss of life due to present-day practice. Most of this loss of life goes unreported, but two or three electrical fatalities per month have been recorded recently by the Shanghai Municipal Council alone.

Mr. Percival would also like to have a uniform standard for the allowable temperature rise in motors and generators. British makers have adopted 40° C., as against the 50° C. of America and the Continent. This means that for the same power output the British machines are about 15 per cent. heavier, but allow of overloads, which are so frequent in China; the more highly rated machines generally will not stand for long without injury.

Potential Developments

Statements that one solution of the world's unemployment is the economic development of China are particularly misleading as regards the electrical position, and have been partly responsible for such a concentration by the world's electrical manufacturers on the China market that prices obtainable are not only frequently unremunerative, but have rendered electrical manufacture in China itself not worth while. It would require extremely complex tariff walls to enable local manufacture to be successful without cramping development. It is, of course, not "dumping" that is taking place, as power plant and motors are certainly not surplus products in the countries of their origin.

The hydro-electric possibilities of China, in particular, have been grossly exaggerated. To-day the average daily load met by hydro-electric means in China does not exceed 1,000 kW. Where the necessary hydraulic and site conditions exist, they are too remote from the possible distribution centres to make their utilisation economic. This is particularly true of the Yangtsze Valley, in spite of reports to the contrary.

Economic stagnation in China must continue, except, perhaps, in such relatively favoured places as Shanghai Canton, and Tsingtau, until an adequate system of transportation exists. This in turn waits on finance.

Finance and Education

The total of current accounts and deposits with the Central Bank of China and the twenty-eight Chinese banks that are members of the Shanghai Bankers' Association is to-day stated to exceed 2,000 million Chinese dollars. Conditions, however, are so uncertain and the elements of sound finance so often neglected in responsible quarters that it has been found impracticable to underwrite public issues of capital for Chinese domestic industries and utilities. Until the Chinese are more willing, or more able, to venture their wealth in this direction, it is very unlikely that foreign capital will become available if it is required.

Yet signs of progress are visible, and the fact that Chapei, Nantao, and Pootung will shortly be electrically interconnected to a much larger extent than they are to-day with the Shanghai Power Company's system points to another way in which co-operation is proceeding.

Another serious, but passing, handicap from which China is suffering is the lack of a sufficient supply of experienced practical engineers. There is urgent need of practical technical instruction for men of the foreman type, for whom the Lester Institute will prove extremely valuable in this respect in years to come.

Mr. Percival said that during the next fortnight seven Chinese university graduates were leaving China to become student-apprentices in British engineering works under the scheme promoted by the Federation of British industries, assisted by the Universities China Committee in London. The majority of them were going to electrical manufacturers' works.

The overall efficiency of electrical plant is to-day so high that it can only be improved by a few per cent., and in some cases by a mere fraction of 1 per cent. In China, as elsewhere in the world, far too much emphasis is apt to be laid on the last fraction of 1 per cent. in the technical efficiency of plant. This in practice is generally swamped a hundred times by losses in administration and management, and, unfortunately, the methods of engineering and science too often begin and end in the purely engineering side of the business.

In conclusion, Mr. Percival said that, because of its adaptability, he has confidence in the ultimate future of China.

Lighting and Transmission Systems

IN a recent paper by Mr. Enright, before the ASSOCIATION OF UNIVERSITY ELECTRICAL ENGINEERS in Dublin, it was shown how the static charges in clouds were evolved, and the modern theories of Wilson & Simpson concerning the polarity of the charges were discussed. The paper described the work done by M. Dauzére and M. Bouget in analysing the results of a number of lightning storms in the Pyrenees, and the work of the American scientist, Mr. N. E. Dorsey, on similar investigations.

Mr. Enright showed that lightning had a predilection for striking localities where, due to radio-active geological formations, the conductivity of the air was increased, and particularly where the conductivity for negative ions predominated. These conditions corresponded to the atmospheric conditions at the approach of the storm and were permanently maintained by ionisation of the air due to the radio-activity of the geological formation. The author discussed the explosive effect of the lightning discharge, and the endothermic chemical reaction in the path of the flash, stating that the temperature attained was of the order of 2,500 deg. C. The explosive energy of the fulminating matter accumulated within "ball lightning" was about four times that of nitro-glycerine.

Typical oscillograms of surges produced by lightning discharges were discussed. The majority of transmission line surges were produced, not by direct strokes, but by induced charges on the conductors due to thunder clouds overhead. The surges produced by a direct stroke had a very steep wave front, and were very destructive to the supply apparatus. Various protective devices were adopted where lightning storms were frequent, but the expense of such protection might not be warranted outside reputed storm belts, Ireland being a case in point.

Mr. T. P. O'Connor, chief operation engineer of the I.F.S. Electricity Supply Board, mentioned that reports of impending thunderstorms were received in Dublin from the Meteorological Office in London, thus permitting the sectionalising of the h.v. system as a precaution against widespread disturbance. The 110-kV system had been free from lightning trouble, but the 38-kV system, and, more particularly, 10-kV terminal stations, had suffered from time to time.

The Electrical Equipment of Cement Mills

THE use of electrically driven machinery in cement factories has increased remarkably during the last five years. In the paper by Mr. E. F. Prickett, which was read before the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on January 9th, a modernised factory designed for an output of 10,000 tons of cement per week is described.

With the exception of the steam locomotives which haul the chalk from the quarry to the washmills, the whole of the plant is driven electrically. The incoming supply is three-phase, 50 cycles, at 3,000 V, and the bus-bar load is usually about 5,300 kW. An emergency supply is necessary for rotating the kiln and for pumping, failure of which might entail serious consequences.

Chalk is excavated by an electric navvy, supplied from a 3,000/500-V transformer sub-station which can be moved about the quarry. The connecting cable is partly underground, partly on short posts, and partly trailing. The trailing portion works under the worst conditions imaginable. The best type was c.t.s. armoured with a steel tape similar to an ordinary flexible steel tube; this would slide over obstructions with impunity, but the factory inspector rejected it as not complying with the earthing regulations. Cable makers were not anxious to supply a similar cable with an earthing core; of the types which they offered, ordinary c.t.s. armoured with a stranded steel flexible wire and an outer covering of c.t.s. is, in the author's opinion, the most suitable.

A large number of motors of different types are used, ranging from 2 to 200 h.p., push-button operated where desirable, but in some instances falling chalk so interferes with limit switches that a reversion has been made from automatic to hand operation.

Cement making is a seven-day job and reliability should be the first consideration. The sudden stopping of a kiln for more than half an hour may ruin the kiln for ever. In the area near the kilns a high temperature is always present, together with clinker dust and coal dust. The clinker dust is of a very abrasive nature and can do considerable harm to bearings and moving parts generally. This makes for the almost general adoption of squirrel cage motors.

D.c. or a.c. Motors?

The advantages of d.c. motors as regards speed control must in this class of work be lost in the excessive maintenance costs due to dust. Owing to the temperature, totally enclosed motors would not be very suitable for operating in the close vicinity of the kilns. At first it may appear wrong, but experience gives preference to semi-enclosed motors for these dusty situations. While it is easier for dust to enter the motors it is also easier to get it out, a compressed air pipe quickly dispersing any accumulation of dust that may have collected. This blowing out can be done while the motor is running. A.c. commutator motors are being tried for kiln driving, but it is too early to make comparisons.

Starters everywhere should be oil-immersed and preferably have an overload adjusting device enclosed in a tank. The only starters that have not given trouble during over four years' working have been two of this type installed in the packing plant. It has been found that a failure to start any motor invariably results in the operator holding down the overload device, when possible, as the first expedient. It must be remembered that practically all the work in the packing plant is on a piecework basis and this causes the employés to take almost any risks to prevent lost time.

Modern Electricity Meter Testing

THE equipment and operation of a large meter testing department are described in the paper by Mr. J. B. Lees, which was read before the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 5th. Testing-equipment design is discussed and the conclusion is drawn that primary resistance-regulated current-loading transformers can be satisfactorily employed. Good electrical performance is considered to be the most important feature of a single-phase meter; and a new method of testing to certify this feature is outlined. The merit of calibrating to special limits of error is discussed, together with routine methods of testing single-phase and polyphase meters.

Experience shows that very flexible equipment is essential, but most standard apparatus on the market is very limited, being practically all single-phase. Improvement of electrical performance and mechanical construction during the past five years has made it increasingly difficult to assess the order of merit of the many different single-phase meters. The trend of low-capacity meter design would appear to be towards concentration on good non-inductive load performance, together with minimum voltage-variation error.

[*J. Edwards, Oldham.*

Mr. J. B. Lees is connected with the Oldham Corporation Electricity Department

Some 46,000 meters are connected to the Oldham Corporation system and the Meter Department, with which the author is concerned, is at present dealing with 10,000 meters per annum.

From 5 to 20 per cent. of new meters are expected to arrive from the manufacturer with errors greater than ±2.0 per cent. at 1/10th load and 1/20th load. It is very unusual to find meters with an error greater than ±2.0 per cent. at loads higher than 1/10th. Experience of operation on circuit has shown that it is good practice to calibrate low-capacity single-phase meters to special limits, those adopted by the author being 0.5 per cent. fast and 1 per cent. slow at full load and 0.5 per cent. slow and 2 per cent. fast at 1/20th full load. Most modern meters have a dip in their curve at about ¼ load, which is taken care of if they are calibrated to the above limits.

It has been the practice for some time to test meters on site with specially prepared check meters, or a rotating sub-standard meter, when complaints arise. Meters fixed on lighting circuits are tested on the lamp or lamps fitted in the room which is most used, on the total lighting load, and on an iron or vacuum cleaner (if the consumer possesses one). Meters fixed on heating circuits are tested on maximum and minimum available loads. It is very rare to find a meter which has errors greater than ±2 per cent. when tested in this manner, although comparison with the original test records has shown that changes up to 1 per cent. slower at 1/20th load and 1 per cent. faster at ¼ to full load take place even after so short a period as twelve months. This performance on circuit is the justification for the special calibration referred to and is to some extent responsible for the conclusion that the best method of testing new meters is by timing on loads held at given values.

The author considers that it would be advantageous if the novel Howarth method of testing polyphase meters for interaction could be adopted by manufacturers as a standard performance test. Unfortunately it could not be used to predict on-circuit performance in terms of percentage error, against single-phase calibration. The chief disadvantage is the need for the special calibration of each element. The author has devised a method, however, by which the two elements can each be adjusted to be as closely accurate as possible on both the unity and 0.5 power factor tests without the necessity for examination of the interaction performance.

Electrical Equipment at the Royal Masonic Hospital

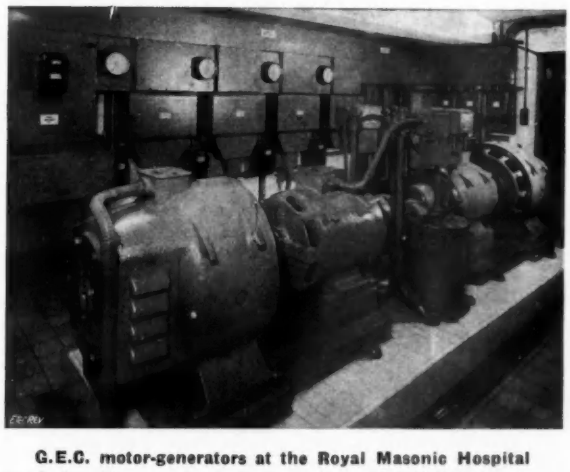
THE Royal Masonic Hospital at Ravenscourt Park, London, W., was designed by Sir John Burnet, Tait & Lorne. It consists of four independent buildings comprising main wards, annexe, electrical and surgical section, and administration blocks; there are nearly a hundred wards. Electrical services abound throughout. The whole of the wiring installation has been carried out in "Magnet" screwed conduit in "Silverlac" and galvanised finish, and this, with the exception of the main runs in the basement (illustrated on page 47), is concealed in walls, floors, and ceilings.

The main switchroom is situated between the Hammersmith Corporation transformer room and the main storage battery room, directly adjacent to the boiler house. The Corporation sub-station is supplied through two h.p. services, the 415-V, three-phase, 50-cycle l.p. supply being connected to two main G.E.C. oil circuit-breakers in the switchroom.

The ward equipments consist of 10-A interlocking plugs and switches and 5-A switches and plugs for bed light inspection purposes, as well as plugs for use with wireless headphones. Each ward has general, night, and reading lights.

In the operating rooms the supply is normally on the Corporation's mains, but in the event of failure the lighting of the whole of the operating theatre units is automatically switched over to the storage battery by means of a special G.E.C. switchboard fitted with automatic change-over switchgear. Electrical services in the Radiological Section are completely isolated from all other parts of the installation, and operating theatres and treatment rooms are equipped with a.c. and d.c. plugs for various apparatus.

There are two 25-kW G.E.C.-Witton motor generator sets, in each case comprising a protected type slip-ring pattern three-phase motor directly coupled to a d.c. generator specially wound for direct running at 230 V, with level compounding, and also battery charging shunt wound up to 315 V. The output control panels have been designed with a view to the elimination of doubtful switching and its consequential troubles. Each outgoing side is protected by a 150-A single-pole circuit-breaker with reverse current trips, and each generator has a 150-A three-pole Witton change-over knife switch. When switched into the upper position the generators run with the compound field in service for direct running. Should both generators be in commission together the third pole of the switch automatically makes the equaliser connection for parallel running. In the lower position the t.p. switches give battery charging and cut out the compound winding. One generator is sufficient to supply the "Chloride" battery, comprising 116 "SFG8" cells of 400-Ah capacity, and by putting the triple-pole switches in the lower position without further alteration it would be possible to attempt a parallel running on the shunt windings, so a further double pole selector change-over switch is fitted to guard against this. A



G.E.C. motor-generators at the Royal Masonic Hospital

ward signalling system is in operation and a G.E.C. luminous staff signalling system also operates throughout the building in conjunction with the telephone system. A silent G.E.C. fire alarm signalling system operates throughout the hospital.

The equipment, with its special silent operation and running features, was designed to the instructions of the consulting engineer, Mr. Stinton Jones, M.I.M.E., M.I.E.E. The electrical contractors were Messrs. T. Clarke & Co., Ltd.

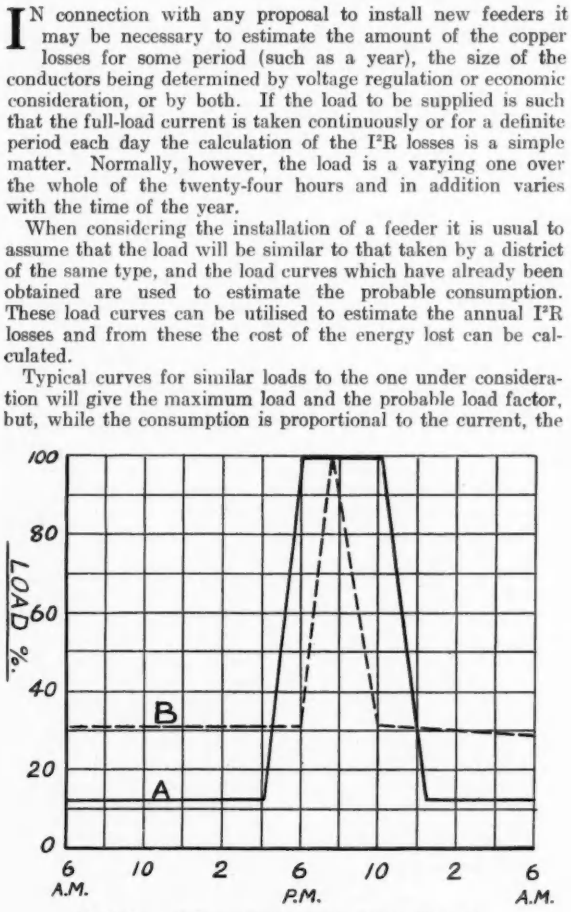
Annual Copper Losses. By J. V. Brittain, B.Sc., A.M.I.E.E.

Deciding between larger cables and regulating apparatus

IN connection with any proposal to install new feeders it may be necessary to estimate the amount of the copper losses for some period (such as a year), the size of the conductors being determined by voltage regulation or economic consideration, or by both. If the load to be supplied is such that the full-load current is taken continuously or for a definite period each day the calculation of the I^2R losses is a simple matter. Normally, however, the load is a varying one over the whole of the twenty-four hours and in addition varies with the time of the year.

When considering the installation of a feeder it is usual to assume that the load will be similar to that taken by a district of the same type, and the load curves which have already been obtained are used to estimate the probable consumption. These load curves can be utilised to estimate the annual I^2R losses and from these the cost of the energy lost can be calculated.

Typical curves for similar loads to the one under consideration will give the maximum load and the probable load factor, but, while the consumption is proportional to the current, the



Variation of form factor with different loads

I^2R losses are proportional to the square of the current. Thus instead of taking the average current we shall have to take its r.m.s. value, and the ratio between the two will depend on the shape of the curve. This ratio is termed the form factor, and if its value is known for any particular type of load the daily I^2R losses can be determined from the load factor and maximum current.

We have r.m.s. current = average current × form factor, and since average current = maximum current × load factor/100, then r.m.s. current = maximum current × load factor × form factor/100. Assuming that the load curve varies for certain days or for certain seasons, it is necessary to calculate the r.m.s. current for each type of day and obtain the sum total for the year.

The accompanying figure shows how the form factor varies with two different kinds of load. Curve A has one peak and the load factor will be found to be approximately 36 per cent. The r.m.s. value is obtained by taking values every hour or two hours, squaring each of these values, finding the means of these squares, and then taking the square root of this mean. The more points taken the more accurate is the result. The r.m.s. value for A will be found to be about 42 per cent., and the form factor is therefore 39/36 = 1.08. Curve B will be found to have the same load factor—namely, 36 per cent.—but the r.m.s. current will work out at over 46 per cent., so that the form factor in this case is 46/36 = 1.28.

The values of this form factor for load curves may vary from 1.1 to 1.3, but as the load curves can only be approximate we shall not make a large error in taking the value at 1.2. As an example of the working of the form factor, consider a three-phase line which has to carry a maximum load of 100 kW at 400 V, at a load factor of 25 per cent., and a power factor of 0.9. Taking the resistance of each line as 0.5 ohm, find the daily energy loss. As the maximum line current is 160 A the r.m.s. current for the day is $160 \times 25 \times 1.2/100 = 48$ A. This current of 48 A can be described as the steady current which flowing for twenty-four hours will give the same actual energy loss per day as the load itself would give.

Energy loss per day $= (\text{I r.m.s.})^2\text{R.t.} = (48)^2 \times 3 \times 0.5 \times 24$ watts $= 82.5$ kWh. The kWh delivered per day would be $100 \times 25 \times 24/100 = 600$ kWh. The loss is thus over 13 per cent. of the total kWh sent out or delivered according to whether the voltage is kept constant at the sending end or at the delivery end of the line.

The Economic Aspect

A rough calculation of this description, in conjunction with the losses incurred in the regulating apparatus, would probably be necessary when considering the installation of a tail-end booster or an induction regulator. Whether this loss is excessive would depend upon the relative costs of energy and of a new line, but voltage variations may make the installation of regulating apparatus essential.

From a purely economic point of view, where a booster or other gear is installed to enable a line to deal with the load which has grown more rapidly than was expected, the cost of the extra I^2R losses in the line and in the booster should be less than the extra capital charges involved in laying a larger feeder, but possibly saving of time and convenience may outweigh considerations of cost.

The losses in a booster or transformer can easily be added to the line losses. To do this the no-load loss can be found directly and the load copper loss can be included in the line loss by adding the respective resistance to the resistance of the line. The same reasoning can be applied to the I^2R losses in a transformer when considering the advisability of buying one with a better performance.

"Ferrocart" Coils

SOME useful information relating to the new "Ferrocart" coils for radio use introduced by Hans Vogt was recently given in the *Zeitschrift des Vereines Deutscher Ingenieure* by A. Schneider, of Berlin. The core of these new coils is made by covering strips of paper on both sides with iron particles. The strips are passed through a warm bath of adhesive insulation and are afterwards compressed, under temperature, into plates 2 to 3 mm. thick, having an area of about 40×20 cm. The resulting material can be treated as a metal and can be readily cut and stamped. It has a permeability of about 12, a specific gravity of about 4, and is mechanically stable up to a temperature of 110 deg. C.; the electrical properties are also stable up to 90 deg. C. As to magnetic characteristics, the saturation point is far above the magnetic densities usually employed in practice.

A toroidal coil having such a "Ferrocart" core has a very small dynamic resistance and a negligible stray field, but is rather difficult to manufacture, and so is used only in special cases. The pot coil is lighter and is easier to manufacture, but the stray field is somewhat greater; its magnetic circuit is broken by a radial air space to reduce eddy current losses, and the total losses are thus reduced by a further 8 per cent. The ironclad or shell-type coil is still simpler to manufacture, and is made from stampings without involving stamping waste. The core-type coil has a large leakage field and it is used only for long waves.

In addition to the reduction of losses associated with these coils, there is the possibility of varying the self-inductance by an adjustment of the air gap—a great advantage over air-core coils. In one form of variable-inductance coil the E-form stampings are held in an insulating frame of transparent material ("Trolitul"). The yoke is supported in such a way that it can be adjusted from outside the case. The inductance can be varied in this manner by as much as 10 per cent. with an accuracy of 0.03 per cent.

There are many applications of "Ferrocart" coils, and in broadcast receivers they can replace air coils for tuning inductances, chokes, and band-pass filters. The advantages obtained by their use are, first, a reduction of losses in oscillatory circuits and a consequent increase in selectivity. They are also considerably smaller than the corresponding air-core coils, and since the stray magnetic field is smaller the screen may be closer and yet involve reduced losses. The receiver may thus be made smaller than hitherto. Finally, tuning may be effected by adjusting the inductance instead of the capacitance, permitting the use of small fixed condensers instead of the variable units now used; this is known as permeability tuning.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Earthing Electrodes

In reply to the letter from Mr. J. Murphy, secretary to the Council of the Electrical Research Association, I should like to point out that the activities of the E.R.A. were mentioned in the first part of my article, published in your issue of November 24th. I have been under the impression, however, that Report F/T59 was not published, as when I obtained a copy from the Research Association I was asked to make no use of the information contained therein without reference to the Association, and assumed that the report was not available to the public.

But for this misunderstanding I should have made much greater use of the information contained therein in the preparation of my article, as the conclusions reached in this valuable report completely bear out the contentions in my articles. From my own observations, and from the details of the E.R.A. report, it is clear that if a state of ignorance of the vital importance of resistance of earthing electrodes does not obtain throughout the industry, then a state of apathy *does*, which to my mind is infinitely worse.

I strongly recommend all engineers concerned with earthing problems to obtain a copy of the Report F/T59, which is a mine of information on this important matter. I shall anxiously await the publication of the further reports mentioned, and have no doubt that many of the present misunderstandings, to call them no worse name, will be cleared up thereby.

T. C. GILBERT.

Folkestone, *January 6th.*

Automatic Street-lighting Control

We note on page 904 of your issue of December 29th, under the heading "Cimmerian Gloom," that you state: "The occasion would have been a good one for demonstrating the merits of automatic control by light-sensitive systems." We think that had anyone been in Hampstead, or Southwark, on the Sutton By-pass, or in many other important places in and around London, they would have said: "The occasion *was* a good one for demonstrating the merits of automatic control by light-sensitive systems."

RADIOVISOR PARENT, LTD.,
C. H. Dobell, *Sales Manager.*

London, W.C.1, *January 3rd.*

An Ingenious Time Switch

Why not collect a few large moths, feed them at a fixed time each evening with a sleeping draught of a quantity calculated to keep them asleep until a predetermined time, when they would wake up and, in accordance with their established habit, dash for the nearest lamp and shatter this with their beating wings, thus extinguishing the light? For this system it would be advisable to wire all lamps in series to minimise replacement costs, also wear and tear on moth. Total capital cost, 1d. for jam-jar with which to catch moth.

The system could also be applied to off-peak water heating, using a lamp as a series link in the circuit. In this case, however, it would be necessary to select one's moth and consumer with care, as otherwise irregularity in the timing of operations might involve kVA charges outweighing any capital-saving consideration—although, from Mr. Meares's remarks, this consideration would appear to be unnecessary!

VENNER TIME SWITCHES, LTD.,
Leslie C. Sharp, *Joint Sales Manager.*

New Malden, *January 4th.*

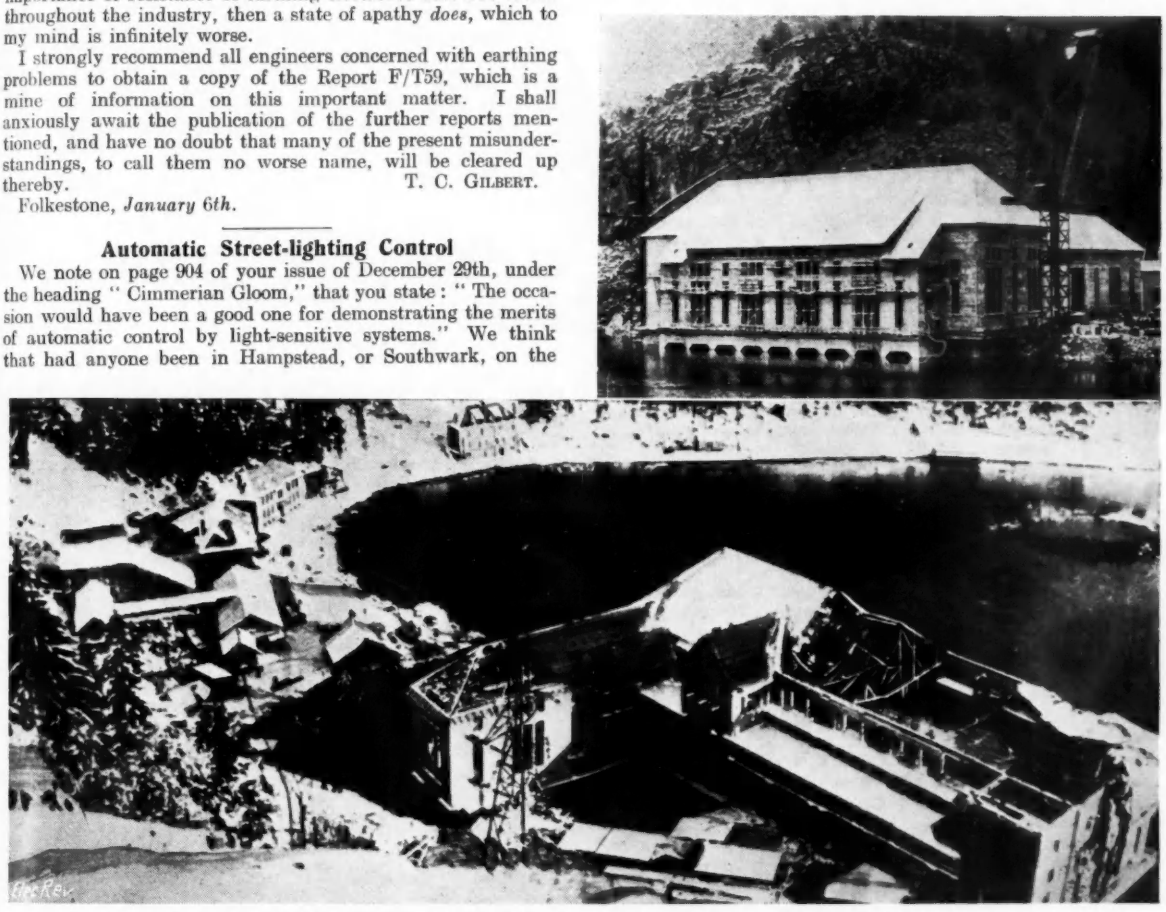
This Prosperity

I am bold enough to assert that many conceited individuals holding degrees and diplomas are not worth the wages of a good dustman. For an engineer, proper training is essential so that he may have an easy start. Added to this, however, must be trustworthiness, and, above all, common sense, which, by the way, should be called uncommon sense.

The man in the electricity supply industry who is worth more than a good dustman is one of the very few who can be relied upon to carry out a simple job promptly and well. "Give it to Jones and you can forget about it," is the finest testimonial any man may win. Jones may be a B.A. or a B.Sc., or a lad from Borstal or a handyman, but he is worth his weight in gold and has no need to moan about his lot in the technical Press.

A. J. ABRAHAM.

Bexleyheath, Kent, *January 6th.*



The Lac Noir hydro-electric station in the Vosges, Alsace, was practically destroyed last week by the bursting of a water conduit and nine men were drowned. Our pictures show the station before and after the disaster

Variations in Distribution Voltages

I was very interested in "Supply Engineer's" criticism of voltage control in rural areas, as I feel strongly that the Regulations have not been drawn up with due regard to the truly rural district. Cases such as your correspondent quotes are quite common in our area; we have numerous consumers even 600 yards away beyond the end of our distributors, and, as our bulk supply is frequently down to its minimum, these distributors are already down to the minimum permissible during heavy load. The consumer 600 yards beyond this has, say, ten lights or probably fewer, but he wants radiators and a cooker, and we run 0.06 sq. in. copper to him alone, at a cost of over £100, and even this section has a resistance plus impedance

of over one ohm, so that an additional 6 per cent. drop is almost inevitable, whilst the maximum commercial expenditure has been incurred.

I am providing makeshift boosters for cases like this, consisting of a current relay and series transformer, the relay being set to make the primary alive at, say, 5 A, and give a 15-V boost to the line. Such an arrangement would not, I presume, be tolerated by the authorities, but my experience is that consumers in areas like ours will put up with much wider variations in voltage rather than be without a supply or pay more for it. As a matter of fact complaints usually come from radio enthusiasts.

I note that the new Regulations state that loads up to 15 kW shall be supplied from one phase and neutral; how is it to be done? Even 5 kW out of balance is quite bad enough in straggling areas; in fact 15-kW consumers are very few and far between and balancing would be quite out of the question. We supply five distinct villages, and not one of these five exceeds 15 kW total, except in mid-winter, and we are supplying electricity at 1½d. per kWh plus a fixed charge, and for a day load we are introducing a two-rate tariff, 1d. for any day load and 1½d. the remainder, but how we are going to keep down to this rate, and observe literally the Regulations, I do not know, if we cannot split up any load under 15 kW. Perhaps this is a misprint for 1.5 kW, which is very much more like the average load for our consumers.

Further, we are at present supplied from two 15-kW and one 25-kW three-phase transformers, and pay an annual rental of £1 per kW for each of these; if 15 kW is to be connected to one phase, these transformers must at once be changed for at least 50 kW each, and our rental would jump up £100 per annum, equivalent to ¼d. per kWh. We can keep our supply within bounds by means of voltage regulators inside our compulsory area, and it seems to me that the Regulations should apply to this area only, leaving the supply company to deal with all consumers beyond the area who may easily prefer a large voltage variation to a large bill for mains.

I shall be very interested to hear the views of engineers controlling similar stations taking bulk supplies, and delivering maximum loads of 50/60 kW as we are doing. We erect all our own mains and have a contracting and sales staff and other important advantages which enable us to make a profit.

Incidentally, we originally had a d.c. generating station and could then quite easily maintain satisfactory voltage, as the prime source of supply was under our own control. If all bulk suppliers were compelled to boost up feeders on load, instead of reaching their minimum at this period, there would still be little difficulty.

CARK & DISTRICT ELECTRICITY CO., LTD.
EDGAR COX-WALKER, M.I.E.E., *Managing Director.*
Feethams, Darlington, *January 8th.*

As joint authors of a recent contribution at present undergoing discussion elsewhere, we do not intend to be involved in protracted correspondence in the Press. Some of the points raised in your issue of January 5th by "Supply Engineer" call for reply, however.

In the first place, we are not connected with any manufacturing concern, but with an electricity supply undertaking. Even forty years' experience is not sufficient justification for ignoring technical requirements. It is admittedly difficult to maintain a supply voltage within small limits at every consumer's terminals at all times; the extension of limit in the new Regulations is presumably intended to cover extreme cases which occur during development and in rural distribution.

In the case considered your correspondent assumes constant voltage at the distribution transformer. The correct application of automatic regulators is to provide a voltage, increasing with load at the distribution transformer secondary, so as to compensate for approximately half the distributor drop, in addition to other voltage drops up to that point. Your correspondent is recommended to peruse, at a later date, some remarks by an engineer in the North-Western Area who is an authority on rural distribution.

"Plenty of copper" is expensive and merely reduces voltage drop on that section; it does not introduce compensation. Voltage regulators permit higher current density for reasonable voltage variation, and with increasing load may obviate costly reinforcement of distributors. Short distributors and frequent transforming points are the ultimate aim in any case.

There are degrees of "imperfection"; but, for domestic purposes, a really poor supply of electricity is definitely inferior to an indifferent gas supply. For lighting, a 10 per cent. drop in volts reduces illumination by approximately 35 per cent., and for cooking, a similar drop reduces the input by about 20 per cent., the efficiency falls and the time taken increases, therefore, by about 30 per cent. With large drops, the final voltage may be too low to permit of cooking with the ordinary type of appliance. Cases have also been cited of consumers who, after meeting relatively heavy expenditure on wiring, have reverted to the use of oil lamps because of inability to read with the electric light provided. Further comment is unnecessary.

W. KIDD,
J. L. CARR.
Manchester, *January 9th.*

In your issue of January 5th "Supply Engineer" mentions balancers and boosters as being quite naturally pushed by manufacturers who have them to sell. Although I have many of these in profitable service I have never been pushed to buy them; on the contrary I have worried the manufacturers to supply them, *i.e.*, tail end boosters, with ultimate success after about three years' pressure. The next assertion is that plenty of copper should be the practice; this is indicative that a 12-ft. crowbar would involve less brain fag than a screw jack when changing a punctured car wheel.

After mentioning his forty years' experience he then asserts the economic impossibility of keeping within the plus or minus 4 per cent. Although I do not agree with this I will not labour the point as an allowance of 6 per cent. has recently been thrown to the industry—I regret this. Surely many of us were on the point of reaching the 4 per cent. margin and some may now rest on their oars with 6 per cent. Percentage drop is a physical problem easily mastered; prohibition is a psychic problem not so easily mastered, and the analogy should not have been given as a reason for washing out the Regulations. However, "Supply Engineer" will have staunch supporters among our competitors. If only we supplied at 20 per cent. or 30 per cent. drop they would have a fat time. (Is "Supply Engineer" in the gas industry?)

Rural districts are mentioned; this has really stung me to reply. There is no measurable drop on the h.p. and the drop, if any, on the l.p. is so easily dealt with that if "Supply Engineer" could have boasted rural experience with the assistance of one of the hundreds of young technical engineers anxious for a job he would not have used the words "hopelessly impossible." "Supply Engineer" wants to know how to supply a consumer 300 yards from the end of a distributor with a 10-kW demand (my mouth waters!). It is possible to supply a 5-kW consumer one mile away from the l.p. supply with a drop of less than the old 4 per cent. allowance.

As we get on we should really not boast of our years of experience; it is so reminiscent of the expert on children who had buried eleven.

W. A. TURNBULL,
Aylesbury, *January 8th.* *Borough Electrical Engineer.*

Electrifying North Wales

Referring to the recent correspondence on this subject, it may be of interest to mention two schemes in the South Wales and Monmouthshire coalfields where "high-tension" transmission was in existence before 1905.

Late in 1902, or early in 1903, the Tredegar Iron & Coal Co., Ltd., put into commission a line operating at 2,200 V from one of its collieries where three-phase medium-pressure current was generated, to supply a colliery about three miles away. The "poles" were "bull head" railway rails and the transformers were air-cooled and insulated completely from earth by being mounted on massive porcelain blocks. Current was also generated at 2,200 V, single-phase, 125 cycles, for lighting. A feeder from this supply was carried on the above poles and feeders were taken to the company's steel works and other collieries.

In the anthracite coalfield of Carmarthenshire an installation was commissioned in December, 1904, in which the generating and transmission pressure was 3,300 V. I was associated with both schemes.

W. R. WILLIAMS,
Group Electrical Engineer.
Gwaun-Cae-Gurwen, *January 8th.*

Current Transformers

I am afraid I cannot agree with Mr. Ellis's interpretation of fig. 235b on page 334 of the "J. & P. Transformer Book." If, as Mr. Ellis contends, the current of 100-A flowing in the loaded secondary phase winding does not contain a zero sequence component, of what is the current in (1) the loaded secondary phase winding, and (2) the neutral connection, composed?

G. A. ROBERTSON.
Fallowfield, Manchester, *January 4th.*

Russian Radio System Extension

A sum of £2,000,000 has been allotted by the Soviet authorities to the extension of the wireless system in the U.S.S.R. during 1934. At present there are about 2,000,000 wireless receiving sets in Soviet Russia, but during 1934 more than 950,000 new sets are to be constructed. About 50 per cent. of these will be distributed in rural districts.—*Reuter* (Moscow).

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

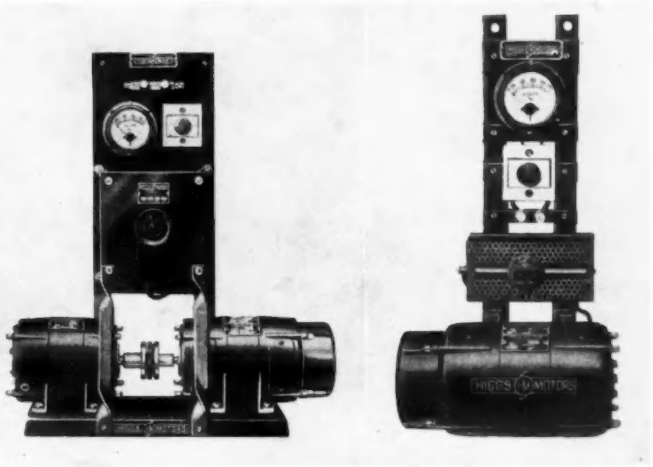
A Three-heat "Glowera" Fire

An important modification in the design of the "Glowera" fire, made by MESSRS. FERRANTI, LTD., Hollinwood, Lancs, has been announced. The fire retains its maximum loading of 2 kW, but instead of two 1-kW elements a 750-W and a 1,250-W element have been incorporated, giving three heats (750 W, 1,250 W and 2,000 W) by means of two switches. The appearance of the fire is as before; an illustration appeared in our issue of October 13th, 1933, page 488.

Electric Stunning Apparatus

Among the many advantages of the electrical method of stunning pigs, sheep and calves is its economy of running costs: A "Lethalor" set using two pairs of tongs costs approximately ¼d. per hour to run with power at 1d. per kWh, it being possible to stun 200 to 300 animals during this period. Stunning by this method is not fatal, the animals recovering after three to five minutes if not stuck. Electrical stunning means better bleeding, as the heart beats continuously during the bleeding process, "splashing," a fault common with other methods, being eliminated with the lethalor. No damage is done to any portion of the carcase and the method is a humane one.

MESSRS. HIGGS MOTORS, LTD., Witton, Birmingham, 6, have brought out a lethalor which, on a.c. circuits, consists of two entirely separate electrical machines, and there is therefore no possibility of the operator receiving a fatal shock. The machine runs on ball bearings, requires practically no attention, and is designed for continuous operation if necessary. The apparatus is complete with regulators, starters, switches, and the necessary tongs, which are made from stainless steel and have handles made of insulating material, a press button switch being incorporated, are listed at £8 5s. per pair. The a.c. model (1-, 2- or 3-phase input, max. voltage 440) costs £19 10s. with output suitable for one pair of tongs, or £22 19s. when suitable for two pairs of tongs. The d.c. model (max. voltage 250) costs £11 17s. and £14 12s. respectively.

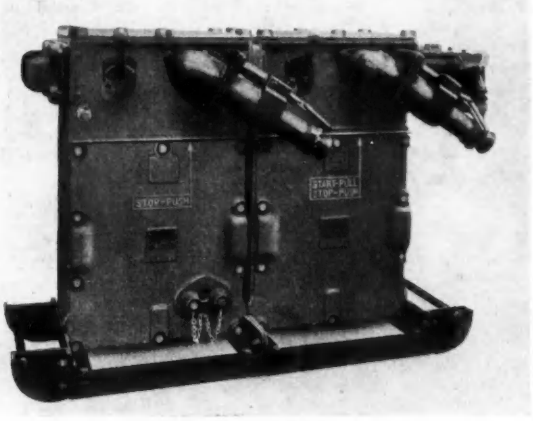


The Higgs lethalor: (left) motor alternator for a.c. mains, and (right) inverted rotary convertor for d.c. circuits

Mining Switch Units

The new mining switch units type "M.U.80" manufactured by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, for the control of coal cutters, conveyors and loaders, embody many improvements. The main electrical equipment is mounted on a panel in a case of welded steel plate (officially certified as flameproof) with malleable iron top and front covers; the case has sectionalised skids.

The standard gear includes a three-pole main contactor with magnetic blow-outs, arc shields and removable contact tips, adjustable overload protection solenoids on three phases with two-rate dashpot (for starting and normal currents), and a voltage transformer (22-25 V) for the auxiliary circuit, H.O. control-circuit fuses, and control interlock relay. Optional features are relays for earth leakage and pilot-core protection, rectifier, flag indicators, resetting devices, and test contacts. In the upper part of the case are fitted a combined three-pole isolating and reversing switch, a push-pull switch for local control of starting and stopping, a core-balance transformer



A two-panel mining switch assembly

for leakage protection, terminals, a 100-A B.S.S. or 30-A plug, and an adjustable cable sealing and trifurcating box. All connections are numbered.

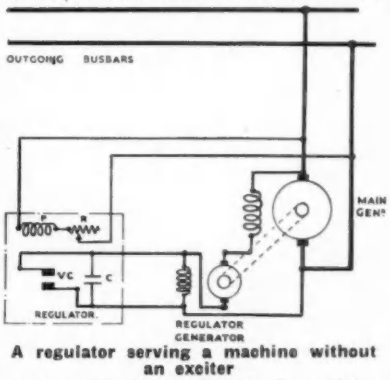
The isolators are operated by an external handle, and before they can be opened a mechanical interlock causes the contactor to open. Other mechanical interlocks prevent the removal of the front cover, except when the isolator is off, and the closing of the switch before the cover is replaced. The coupling plugs have one short and three long pins. A screw mechanism ensures slow withdrawal so that the short pin breaks the interlock control circuit, thus causing the contactor to open before the power pins are withdrawn. Arcing is limited to 25 V within a flameproof compartment inside the plug.

With pilot-core protection for remote control, failure of switch operation due to short-circuit between the pilot and earth wires is guarded against by the use of two half-wave metal rectifiers—one in the control switch and one in the mining unit. These are connected in opposition and in series with a relay, so that a fault between pilot and earth disturbs the balance, causing the contactor to be opened. To prevent the unexpected starting of a motor after an interruption of supply a resistance is put in circuit with the relay winding so that reclosing of the contactor is prevented until after the master switch has been returned to its off position.

Automatic Voltage Regulators

For guarding against the voltage effects of sudden speed and load variations, MESSRS. J. G. SMITHSON & CO., LTD., Nelson House, Moor Street, Birmingham, 5, have introduced an automatic voltage regulator suitable for service with small d.c. generators (up to 16 kW) without exciters and a.c. or d.c. generators of up to 200 kW with exciters.

A small regulator - generator takes the place of the usual field rheostat, and the field of this regulator is controlled by a vibratory regulator. When installed for a machine without an exciter the regulator - generator is connected in series with the field of the main generator, the vibratory regulator having its contacts across the field of the regulator generator. The contacts are opened by the pull of the operating coil when the voltage is sufficiently high, and the regulator-generator is thus inserted in the shunt field circuit, the consequent excitation producing a back e.m.f. in the shunt field of the main generator. The resulting voltage fall will cause the contacts to close again.



A regulator serving a machine without an exciter

R., variable ballast resistance. P., regulator operating coil. V.C., vibrating contacts. C., condenser.

Connection to the exciter field is similar, and so is the operation. Four types of the equipment are available: two for 400-W, 25-V main machines and exciters, and two for up to 15-kW main machines and exciters. The vibratory regulator is totally enclosed, and the generator is enclosed-ventilated and runs at 2,000 r.p.m. The generator may be direct coupled or belt driven.

An Improved "Magnet" Stockpot

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has lately introduced an improved stockpot and soup boiler for hotels, restaurants, canteens, and other establishments where bulk quantities are prepared. The heating element consists of a 12-in. diameter totally enclosed "Magnet" boiling plate loaded at 300 W, the boiling plate being mounted

on a cast-iron stand, finished in grey vitreous enamel on the top, and the base in black enamel. A three-heat control switch with fuses is mounted underneath a protecting ledge at one side of the base.

The container itself is made of heavy gauge aluminium to

The improved "Magnet" stockpot

fit on to the boiling plate, and the base is made dead flat so as to ensure intimate contact. In this improved pattern the standard size of the stockpot is 16 gall., experience having shown that this increased capacity is the most useful for all purposes.

An Improved Lamp Filament

With a view to the elimination of sharp bends, and consequently hot and cold spots, in the filament of the higher voltage (200-260 V) vacuum m.f. lamp, *i.e.*, one with its filament so long that it cannot be mounted in one plane, and employing staggered or "double-decker" construction, OMEGA LAMP WORKS, LTD., Rodney Place, Merton Abbey, S.W.19, have introduced a new filament.

The new "Omega" helical lamp filament

This is of helical formation, which permits an extra "deck" without the necessity of turning back or the introduction of sharp bends in any other way. The filament is mounted between two electrodes, one of which passes through the central tube in which the filament supporting wires are inserted and is sealed in to the top of the tube. The other electrode passes out at the side of the glass in the usual way. Apart from the obvious advantages of the elimination of hot spots, the construction seems to us to be suitable for situations in which vibration has to be contended with, such as, to quote a typical example, in traction work.

We understand that there is not likely to be any increase of price for lamps with the new type of filament, which will be available in from 15-W to 60-W sizes.

Dielectric Strength and Ratio.

By F. G. W. Tree, A.I.E.E.

WITH the extension of the use of high voltages with electrical and radio equipment, it has become increasingly important to pay particular attention to the type of current used in testing. The use of high-voltage a.c. for testing cables and ordinary condensers has often resulted in misleading data being catalogued, and has often permanently damaged the dielectrics under test, because engineers have regarded the dielectric strength (*i.e.*, the ratio of a d.c. disruptive voltage to the crest value of an a.c. disruptive voltage) as unity for all materials. Accordingly, large capacity testing apparatus has been frequently necessary where much smaller d.c. apparatus would have been more effective. This ratio depends upon the mechanical, physical, and thermal conditions of materials, and become nearer unity the more homogeneous the dielectric.

The nature of insulation breakdown under a.c. voltage differs in some features from that under d.c. voltage, and thus the ratio varies according to the particular feature predominating at the time of breakdown. Breakdown is not due solely to a simple effect of electrostatic stress, heating, or to any specific deterioration process, but to a number of effects combined. Temperature effects often dominate at the instant prior to puncture of insulation, and local temperature effects materially lower the dielectric strength.

Local heating may be expected to be lower with d.c. voltage, since those energy losses (*e.g.*, dielectric hysteresis) which accompany alternating fields do not exist. The conduction current and, therefore, the I^2R losses in the dielectric are much larger with a.c. than with d.c. Breakdown depends also upon the rate of application of the test voltage, and a low pressure rapidly applied may cause a puncture, while a much higher voltage more slowly applied might not do so. Since the ratio of most materials falls with increasing temperature, due consideration should be given to the difference between test conditions and those likely to exist when the cable or condenser is in normal operation. The absence of intensive corona and dielectric losses also makes the likelihood of damage by d.c. voltage considerably less.

Temperature Effects Upon Oil

Tests on oil and petrolatum between 2.5 cm. spheres, and cable paper between 5 cm. plates have indicated that the dielectric strength of oil decreases with increasing temperature with both d.c. and a.c., though not to any great extent. The results obtained with transil oil were somewhat erratic, but indicated 8 per cent. greater strength under alternating pressure. It is significant that the combined averages of all the ratios obtained at 25 and 50 deg. gave 0.9, but those of all the ratios at 75 and 100 deg. gave 0.94, showing an increase in dielectric strength ratio with increasing temperature, within certain limits.

Petrolatum, which at room temperature has a consistency the same as vaseline and is closely related to amorphous hydrocarbon of the paraffin series, has the same general characteristics as transil oil. Its dielectric strength and its ratio under test do not appear to change very appreciably between 25 and 100 deg. The erratic behaviour of the oil may have been due to mechanical motion, produced in the ingredients of its non-homogeneous structure, under d.c. voltage, and the resultant concentration of the weaker ingredients might account for its lower strength; the more viscous petrolatum would show still less the effect of any concentration.

Although a.c. and d.c. tests showed no definite difference in the dielectric strength of unimpregnated paper, there is evidence of a pronounced effect on the ratio. Dry unimpregnated paper appears to have a lower ratio for alternating than direct voltage, which must be 10 per cent. higher to puncture the same thickness of paper, under otherwise identical conditions. From the figures obtained, 1.1 for untreated paper and 0.95 for petrolatum, a combination of the two might be expected to give a ratio near to unity, but according to the tests with paper impregnated with petrolatum, the average ratio was 1.77.

Inorganic dielectrics, *e.g.*, clear mica, gave a ratio very little above unity. Pure mica seems to be the same for both a.c. and d.c., but built-up mica showed a ratio in favour of d.c. to the extent of 1.24. Glass showed a ratio of 1.46 in favour of d.c., but it is not known whether this high value was due to lack of homogeneity of the glass tested.

Materials in Combination

If a dielectric consists of two or more materials having different resistivities, or different capacities, or both, the distribution of voltage through the dielectric gradually changes. At the moment of voltage application, the distribution between the components is in proportion to their specific capacities. Gradually, however, the voltage distribution changes to a distribution proportional to the resistivities of the components, and electrostatic charges build up in the interior of the dielectric at the point between the components. The charges have to be conducted through the dielectric, but, due to its high resistivity, the energy readjustment occurs with extreme slowness. By this slow, transient process, the energy stored in the cable or condenser under test builds up rapidly, and the distribution of dielectric stress between the component dielectric changes; to this may reasonably be ascribed the difference between the a.c. and d.c. dielectric strength values.

These results suffice to show that both a.c. and d.c. pressures have separate uses in electrical apparatus testing. To-day, high voltage d.c. is readily obtainable by the use of even small thermionic rectifiers, and thus, the old argument in favour of a.c. does not hold. Indeed, since there is no permanent charging current with d.c. voltages, the use of rectifier-transformer units of a few kW capacity may easily displace a.c. testing equipment having an output of many hundred kVA.

Economy is certainly on the side of d.c., and in a number of cases the danger due to delayed faults is entirely removed when it is used for testing. Delayed faults may be regarded as those caused during the application of test pressures, but which, although not disclosed by breakdown at the time of testing, shorten the life of the element subjected to them and cause breakdown at a later date. In view of these important points it is unwise to specify either a.c. or d.c. for each and every class of dielectric under test.

Prospects in Southern Rhodesia. By Douglas Spencer

Improvements in local industries

THE success of the £2,250,000 loan raised by the Southern Rhodesian Government for the purchase of the mineral rights of the colony from the British South Africa Company has attracted a good deal of attention to the colony. It has also given the lie to the pessimists who had been maintaining that the coffers of the Old Country had been drained dry by unpaid war debts due to her, unemployment doles, and general shrinkage of national and personal income.

The obvious improvement in trade at home and the reduction in the totals of the unemployed have been and will be still further reflected in the activities of the Dominions and the colonies—Rhodesia in particular. The premium on gold brings about £1,000,000 a year into this little colony of about 50,000 whites, and the majority of it is spread over the small producers, apart from the large limited liability companies, such as the Cam & Motor, the Globe & Phœnix, the Rezende, and one or two others. Another thing is the increasing popularity of Rhodesian tobacco, and a probably still more important factor is the success of the initial experiments in the shipment of Rhodesian chilled beef. This last industry will probably have a very great effect on electrical development in the country, as we shall explain later.

At present development is, in the main, confined to the municipalities and towns. Salisbury and Bulawayo talk of spending about £35,000 each, both chiefly in the extension of mains or overhead lines for industrial and mining purposes. Gatooma has a similar scheme before its town council, and Gwelo is also calling for tenders. In these directions at least £100,000 should be spent during next year, apart from resulting requirements in motors, &c.

The new hydro-electric plant on the Seigneury Mine, controlled by the Minister of Mines, the Hon. W. S. Senior, is soon to be started up. The actual particulars of the plant are not very interesting. It is the principle involved which is important, and the development will prove to be extremely instructive. A dam has been thrown across the Umfuli, with a width of 420 ft.; the head is 16 ft., and the power to be installed 240 h.p. A further dam about four miles higher up the river is to be constructed for storage purposes, with the possibility of a further low head development. The Umfuli is not different from other rivers in the country, and what has been done at the Seigneury Mine can be done in other cases, even though, unlike the Seigneury Mine, the mines may be some distance away from the power station site.

Power and Irrigation

The development should be eagerly watched by those who have experience of "power-cum-irrigation" schemes. The power possibilities of such schemes are obvious, but the irrigation side will depend for its development almost more than anything else upon the growth of the chilled beef industry, which would probably go hand in hand with an increased development of the citrus industry.

What, however, the country needs is sound technical advice, and all who know what is required of an engineer capable of drawing up a report on a complete hydro-electric scheme, especially when it is coupled with irrigation, will know that he has to be equipped with a very wide knowledge, as wide even as that of the engineers of the "omnium" agencies which at present represent some of the English electrical engineering works.

The time is obviously approaching when the British electrical industry will have to take steps similar to those recently taken by the automobile manufacturers, which have resulted in a really remarkable increase in the sales of British motor cars. The Imperial Airways have cut down the time taken on the journey from England to Rhodesia by more than half, and tap a very fertile field for electrical enterprises. Thus an enterprising engineer, either in a commercial or consultative capacity, cannot plead unreasonable distance from his headquarters.

It should be remembered that while money for municipal electrical developments is found locally a consultant from Johannesburg is quite satisfactory, but as soon as the financial requirements become large enough to warrant a London issue London consultants will find a field open for them. In any case their advice, and especially their inspiration, would be exceedingly welcome. The time is passing for the drawing up of ideas for electrical developments by those of limited local experience, either in Rhodesia or the Union.

Rhodesia is a country which should be visited for business purposes over the period from April 1st to October 31st. In the last two weeks prior to writing (November) 9 in. of rain has fallen in the writer's district—not a good dressing for the average mine road. In the winter season rain is practically unknown, and the liberty given to a business investigator by the use of a "safari" type of motor car leaves him ample opportunity to make complete and first-hand inquiries—not to mention first-hand and very appreciative friends.

Trade Figures

A perusal of the trade returns of Southern Rhodesia does not actually give the impression that there is at the moment a very great market for electrical machinery. The figures below will give an idea of what it has been in 1931 and 1932, and of the amount of British and non-British material sold:—

	1932.		1931.	
	British.	Non-British.	British.	Non-British.
	£	£	£	£
Batteries	11,609	1,987	7,273	5,030
Motors...	5,446	877	4,599	1,010
Transformers...	3,255	609	5,112	2,796
Other electrical machinery ...	26,323	3,737	36,178	6,240
	46,633	7,210	53,162	15,076

The decrease in the total for 1932 can probably be traced to the purchase by one of the municipalities of a large amount of material for extensions in 1931, so that it is not to be assumed that the electrical business is on the downward grade. If only part of the proposed developments is put in hand in 1934 six figures should easily be reached.

The fact is that Rhodesia as a whole is emerging from the "any old engine and a belt" stage. Closer development in the gold mining areas, as has been pointed out at municipal meetings, will lead to the wider adoption of electric drives. Those who know the difficulties and annoyances of raising power from wood fuel, charcoal and crude oil will agree with the comment of a Rhodesian daily paper on the Gatooma scheme—"The transport of wood will be reduced, and crude oil will not be a necessity. Electricity will do away with the fuel transport difficulties of the wet months."

The great danger, in my opinion, is that the units installed in the power stations will be too small to meet the load which will be put upon them when miners and others discover the innumerable benefits which follow the installation of electricity.

Measuring the Flatness of Hot Plates and Utensils

THE performance and economy of enclosed, as distinct from radiant, hot plates depends materially on the flatness of the top of the plate and the bottom of the utensil. Any irregularity of surface prevents metal-to-metal contact, and the thermal resistance of the intervening layer of air retards the heating of the utensil and increases the energy consumption. A new and simple method for determining average unevenness of surface, described by Dr. G. Dettmar in *Elektrotechnische Zeitschrift*, eliminates the point-by-point use of an indicating gauge and gives a reliable measure of the average lack of truth of a surface, with no other apparatus than a surface plate and a sensitive balance.

A few drops of paraffin oil are placed on the surface plate, the unevenness of which does not exceed 0.001 mm., and the surface of the hot plate or utensil to be tested is placed on the oil. A heavy plate or utensil will settle down into three-point metallic contact in one or two minutes, while a light utensil may require ten minutes or less if loaded. Oil expelled from between the surfaces is mopped up with cotton wool and, when no more emerges, the surfaces are separated and the oil on both is soaked up by clean cotton wool weighed before use. The cotton wool is again weighed after soaking up all the oil.

The requisite calculations are then as illustrated by the following example:—Weight of dry cotton wool 15 grm.; weight of wool plus oil 34.08 grm.; weight of oil (by difference) 19.08 grm. Sp. gr. of oil 0.86; volume of oil 19.08/0.86=22.2 c.cm. Diameter of hot plate 22 cm., surface 380 sq. cm. Mean unevenness 22.2/380=0.0584 cm.=0.584 mm. This particular determination compares with 0.566 mm., the average of 100 readings of an indicating gauge.

Tests indicate that the loading of the tested surface, to hasten the expulsion of surplus oil, has no appreciable effect on the accuracy of the determination. The method is applicable with paraffin oil to surfaces with 0.07-1.5 mm. mean error; for better surfaces, a thinner (and, for worse, a thicker) oil should be used, but such cases are of minor importance in practice. The time occupied by the paraffin test is about 15 min., against two hours for 100 gauge readings.

The Chinese Trade Position

MR. LOUIS BEALE, C.B.E., Commercial Counsellor at Shanghai, and Mr. G. Clinton Pelham, Commercial Secretary at Hongkong, have prepared a report for the Department of Overseas Trade on trade and economic conditions in China (Stationery Office, 4s. 9d. net). This is a most comprehensive review of the situation. The tremendous trade potentialities are touched upon and some reasons are given for the backwardness of the country. The authors think that there is hope for the future in the realisation by the Government of the necessity for economic planning and co-operation.

In the last few years China has actually become an exporter of manufactured goods—to a small extent. Products valued at about £6,000,000 were exported during 1930, among them being electric lamps and fittings. The indications are that the future demand of China will be for capital, rather than consumable, goods. It should be the policy of British industrialists to co-operate with China's business men and industrial leaders in the country's development.

Electrical Trade

Tables in the report show that the United Kingdom's share of China's import trade rose from 8.2 per cent. in 1930 and 8.3 per cent. in 1931 to 11.2 per cent. in 1932—apparently due to the anti-Japanese boycott of the last-mentioned year. Our share of China's export trade has ranged between 7.0 and 7.6 per cent. during the past four years.

In 1932 the imports of machinery and machine tools into China had a value of 48,187,000 standard dollars against $67,318,000 in 1931 (St. $=1s. in 1931 and 1s. 2.8d. in 1932). Of this electrical machinery accounted for $6,369,000, against $5,516,000. Great Britain was responsible for the supply of 33 per cent. of the electrical machinery requirements in 1931, Germany occupying second place with 16 per cent. In 1932, however, the positions were reversed; Germany provided 39 per cent. and Great Britain 25 per cent. The other principal suppliers were the United States and Japan.

The report says that the gradual increase in the value of imports of electrical machinery is noteworthy, and is an indication of the comparatively rapid modernisation of this country in many respects. Very many towns in the interior have their electric light plants, and in the large cities electric power is used to a great extent. With regard to the competition in the supply of this class of machinery, the increased value of imports from Germany was not maintained in 1933; her supply in the first four months of that year was only one-fifth of her supply for the same period in 1932, while her share of the total imports of electrical machinery for that period of 1933 was only 24 per cent., as against 54 per cent. of the total for the first four months of 1932. During the 1933 period the United Kingdom, the United States of America, and Italy increased their shares—the United Kingdom from 18 per cent. to 25 per cent. The total trade, however, decreased in the first four months of 1933 to about six million dollars, as compared with about eight million dollars for the same period of 1932.

The value of imports of telephone and telegraph instruments and materials (including radio sets and parts) declined from $14,301,000 in 1931 to $5,939,000 in 1932. The share of the principal supplier—the Belgo-Luxemberg Economic Federation—remained at about 30 per cent., but that of the United Kingdom dropped from 10 per cent. to 4 per cent. Only Germany supplied more material of this class, her share rising from 10 to 19 per cent. The bulk of the radio apparatus came from the United States.

As regards electrical materials and fittings, the report shows that imports were halved in 1932, falling from $27,617,000 to $13,896,000. The United Kingdom's share, however, rose from 10 to 17 per cent.; Germany's from 15 to 21 per cent.; and that of the United States from 19 to 29 per cent. On the other hand, purchases from Japan fell from 33 to 21 per cent.

Communications

According to statistics issued in 1932 the Chinese Government Telegraph Administration operates 99,217.5 km. of lines connecting all the principal ports and commercial centres. The Chinese Government Radio Administration operates wireless commercial services. On December 6th, 1930, a Radio Corporation of America system with two 20-kW transmitters was opened for traffic with San Francisco. An installation by the Société Francaise des Téléphones Interurbains of two 15-kW transmitters was opened for communication with Paris on February 19th, 1931, and a Telefunken system of four 2-kW transmitters was opened on April 7th, 1930, for communication with the Philippines and Java.

A contract was recently signed by the Chinese Ministry of Communications with Marconi's Wireless Telegraph Co., Ltd., under which two 18-kW beam transmitters were to be installed before the end of 1933. Direct commercial wireless service to the United Kingdom and an extension of the service to the United States will thereby be effected.

New Books

Alternating Current Circuits. By M. P. WEINBACH. Pp. 417; figs. 154. London: Macmillan & Co., Ltd. Price 20s.

This book is one of a series on engineering science to which the author has already contributed a volume on telephone transmission. It is intended chiefly as a textbook in college and university courses, and is applicable to both power and communication circuits. Chapter I, which is a brief outline of the fundamental laws of electrostatics and electromagnetics, should surely have included an exposition of Maxwell's electrostatic and electromagnetic coefficients.

In the third chapter the author usefully presents the algebraic, symbolic and exponential methods of representing vector quantities, and we are in agreement with him in regard to the advantages of the symbolic method in vector addition and subtraction and of the exponential notation in circuit analyses. The locus diagrams in Chapter IV are of particular interest.

A set of problems, bearing upon each chapter in the book, is given at the end. The book is well and clearly written, and contains many features which mark the care which has been given to its compilation. The mathematics employed will present no difficulty to the average senior student. The production of the volume leaves nothing to be desired, and we recommend it to those anxious to obtain an intimate knowledge of a.c. circuit theory.

Electrical Circuits and Machinery. (Vol. II, Alternating Currents.) By J. H. MORECROFT and F. W. HEHRE. Pp. 582; illus. London: Chapman & Hall. Price 28s.

The three volumes in this series on continuous currents, alternating currents, and experiments, are now fairly well known. The third edition on alternating currents has been enlarged, and much new material on electrical machinery has been introduced. The early chapters contain a great deal of what is usually found in standard works on technology—if anything, some parts are too elaborate. For example, the greatest care is taken to explain correct phase connections. Of this we have no right to complain, but we cannot escape the thought that in places the same end could be reached in a simpler way.

Considering the small amount of the calculus that is needed in elementary technology it is regrettable that eminent authors still find it necessary to give alternative modes of proof or explanations. Surely by now it is appreciated that this subject cannot be properly taught without a knowledge of the elements of the calculus.

In the section on alternators an interesting note on hydrogen cooling mentions that by its use the rating of machines can be increased by 25 per cent. and the efficiencies by 1 per cent. It is worth going a good way in introducing precautions to obtain these benefits. One illustration shows a cylindrical tank containing a hydrogen-cooled synchronous condenser rated 10 poles, 50,000 kVA, 600 r.p.m., 13,200 V, 50 cycles. The main criticism of the chapters on machines is that, if anything, they are too qualitative and too little quantitative.

Towards the end of the book, where rectifying devices, transmission of power and a.c. meters are dealt with, the descriptiveness degenerates into scrappiness in places—whereas in the earlier chapters, some of the discussions are too long. Transients do not seem to be dealt with, and the brief mention of various appliances has tended to crowd out or restrict fundamental matters. Many useful examples are given, but no answers. There is no doubt about the excellence of this book, but it is scarcely of the type used by the student in this country taking regular courses of electrical technology.

Physical Mechanics. By R. B. LINDSAY. Pp. 436; illus. London: Chapman & Hall. Price 21s.

One of the most serious faults of many British degree courses in physics and engineering is the relegation of mechanics to a subsidiary position, very much on a par with that of pure mathematics. This is not so in the United States, the subject being more generally taught as an integral part of theoretical physics, and we have in this text by Professor Lindsay an excellent exposition on these lines. To the physicist the necessity for a sound knowledge of mechanics, more indeed than this book gives, has become very plain in the last decade with the development of quantum mechanics.

The general scope of the book can be indicated by the range of pure mathematical knowledge required—general familiarity with the elementary methods of the calculus, but no presupposed knowledge of the special functions. Vector methods are used with a certain restraint. This is commendable, the elementary vector calculus being readily understood, but the advanced methods and notation requiring more familiarity to be of value than the average student will have time to acquire.

Of the twelve chapters, the first is devoted to the elementary

concepts of mechanics. The dynamics of a particle are dealt with in the next three, and statics (particle and rigid body) in the two after these. Then follows a long chapter on rigid dynamics. The remainder are on constrained motion, oscillations, the motion of aggregates of particles, deformable bodies and wave-motion, and hydromechanics. If the scheme is open to criticism, it is in the matter of grouping, and of breadth of treatment rather than depth. As examples of these, the generalised methods of Lagrange and Hamilton do not appear until late in the book, whereas experience shows that for them to be useful working tools they should be introduced as early as possible, and, again, it may be questioned if even cursory reference to atomic theory is really in place in this book; the criticism is not that atomic theory in itself is not of great importance, but rather that its introduction here tends to distract attention from the main subject.

It is unfortunate that the price of the volume is high, as it will almost certainly make what would be a good text-book into a work of reference.

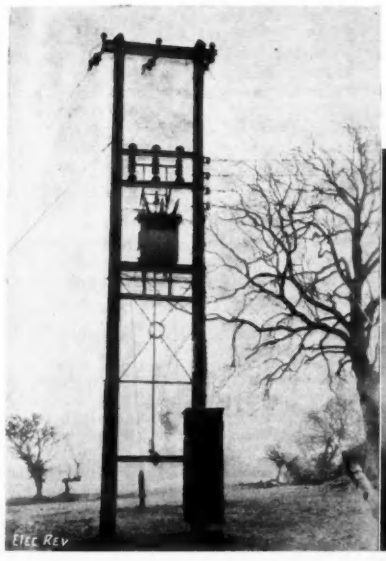
Commercial Cinematography, by GEORGE H. SEWELL. Pp. 180; figs. 64. London: Sir Isaac Pitman & Sons. Price 7s. 6d.

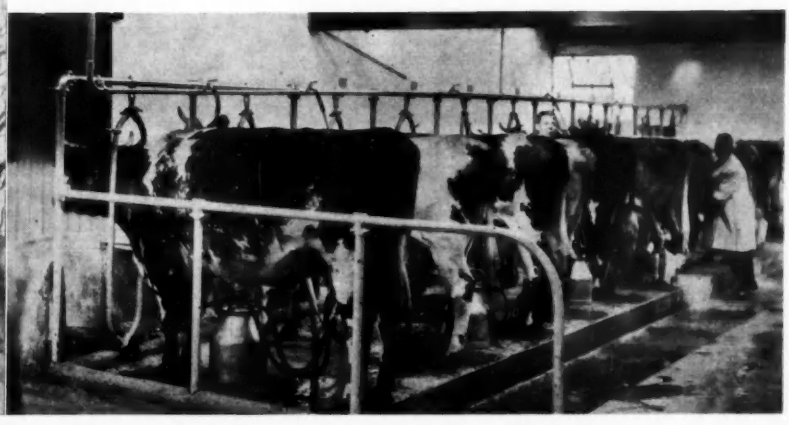
This little book is really written for photographers or business houses intending to produce 16-mm. films for commercial and publicity purposes. The "sub-standard" film is, of course, non-inflammable and can therefore be shown anywhere. With a good projector it can be made to throw a picture of at least eight feet by six, and is thus big enough for most propaganda purposes. Movement, as Mr. Sewell says, is a powerful demonstrator, a powerful educator and propagandist.

Mr. Sewell, who is chairman of the Institute of Amateur Cinematographers, gives some admirable advice as to lighting, including the choice and purchase of lamps, on the use of the latest types of exposure meters, and on the cycle of operations necessary to make a successful picture having continuity and holding the interest. The final chapter introduces the subject of the sound film in commerce.

Rural Development at Clitheroe

CLITHEROE Corporation Electricity Department began the New Year well by inaugurating a supply in the village of Rimington, thus completing the compulsory work prescribed in its Extension Order of January of last year, which brings the total area served by the undertaking to 185 sq. miles. During the intervening twelve months the Corporation has connected half-a-dozen villages to the h.v. system, and many farms which use the supply chiefly for milking, bottle washing, water boiling and cooling, and light and heat for pig and poultry rearing.





Left: The Rimington (Clitheroe) pole sub-station. Right: Electric milking equipment in use

The three-phase 11-kV line to Rimington forms part of a ring main giving a duplicate supply to Gisburn village, from which Rimington is 2¼ miles distant. It runs entirely out of sight of existing property and the main roads, and terminates on an "H" pole fitted with outdoor type switches and fuses and a 25-kVA three-phase transformer.

The l.v. network is erected behind the property on wood poles, and Mr. A. H. Todd, the borough electrical engineer and manager, has been able to place the poles in almost every instance behind buildings or trees. Eighteen out of a possible twenty-five consumers have been connected, and it is proposed within the next six weeks to give a supply to Stopper Lane and Newby, where there are twenty-one houses. No gas is available, and there are no small industries.

Current was switched on at Gisbourne sub-station by Mr. H. King-Wilkinson, chairman of the Rimington Parish Council, and in the village itself by Mr. R. C. Assheton, J.P., on January 3rd. At the luncheon which followed Alderman J. Boothman, chairman of the Clitheroe Electricity Committee, stated that the capital expenditure on the undertaking to date was £110,000, and the annual revenue £15,000. The net profit last year was £140, but the undertaking was run as a service and not for yielding a surplus. The average consumption was 1,000 kWh per consumer. Among those present who made brief speeches were Messrs. A. W. Clegg, W. E. Starkie, and W. A. Royle, the borough electrical engineers of Accrington, Burnley, and Blackburn respectively.

Electrical Manufacture in Canada

THE Dominion Bureau of Statistics has recently published its annual review of the Canadian electrical apparatus and supplies industry, covering the year 1932. In this it is shown that the total value of production was $53,264,918—a decline of 35 per cent. in comparison with 1931. There were 169 factories engaged in the industry, the majority of them (125) being situated in Ontario. These plants represented a total fixed and working capital of $82,458,754, and they employed a monthly average of 14,305 people. Salaries and wages amounted to $16,262,368, and materials were purchased to the value of $20,414,844; the total value added by manufacturing was $32,850,074. In addition to the purely electrical concerns, factories in other groups (including washing machines and lighting fixtures) produced electrical equipment to the value of $10,144,799.

During 1932 the imports of electrical apparatus and supplies into Canada were valued at $7,708,111, as compared with $16,775,208 in 1931. The total included radio apparatus, $1,298,783; motors, $1,082,566; telephone apparatus, $472,581; switches and switchboards, $533,644; electric lighting fixtures, $257,901; batteries, $365,500; and transformers and parts, $332,694. The export total was $1,317,000, the principal items being cooking and heating apparatus, $359,460; sparking plugs, $318,204; telephone, telegraph and radio apparatus, $258,600; and batteries, $183,406.

The nature, quantity and value of the production is set out in some detail in the report. The following table gives the leading items in the list with values for 1931 and 1932:—

Description.	1931. $	1932. $	Inc. or Dec. $
Wires and cables (except aluminium) ...	10,165,373	6,566,201	— 3,599,172
Radio sets and parts	14,116,148	5,549,941	— 8,566,207
Telephone material	7,396,505	4,415,580	— 2,980,925
Batteries	5,016,980	4,240,892	— 776,088
Incandescent lamps (standard size) ...	17,102,308	3,597,173	— 13,505,135
Generators, a.c. and d.c.	4,376,405	3,445,925	— 930,480
Refrigerators	2,788,917	2,983,100	+ 194,183
Transformers	4,982,976	2,871,559	— 2,111,417
Vacuum cleaners, washers, ironers, clocks, floor polishers, etc.	3,548,796	2,738,711	— 810,085
Motors, a.c. and d.c.	3,401,627	2,233,226	— 1,168,401
Switchgear and protective equipment...	3,933,258	1,919,452	— 2,013,806
Radio valves	2,298,098	1,543,090	— 755,008
Cooking and heating apparatus ...	1,551,017	1,095,196	— 455,821
Lighting fixtures	1,123,146	851,345	— 271,801
Meters and instruments	1,211,984	704,096	— 507,888
Conduit	713,262	624,543	— 88,719

It will be seen that the decline in production was general; only one of the principal items—refrigerators—showed an increase.

The report includes the names and addresses of all the manufacturers whose products are included in the returns.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Developments by Bruce Peebles

It is significant that an increasing number of orders for motors for new factories engaged in a large variety of trades, as well as schemes of conversion and reorganisation, are being received by Messrs. Bruce Peebles & Co., Ltd. This company has put on the market a new range of a.c. motors for general industrial purposes, and an integrally fitted a.c. motor for driving beater rolls used in the manufacture of paper. While the demand for converting plant has fallen off somewhat, orders for glass-bulb mercury-arc rectifiers are on the increase; these include many for cinema projection arcs. Grid control has been applied to the voltage regulation of some of the rectifiers supplied. The cut-off point of the negative potential can be controlled manually through a potentiometer resistance or automatically to give a compounding characteristic for running on traction service in parallel with rotary plant. Another new development is the "Rectigor" for battery charging; this employs a mercury arc bulb.

Among the more important orders obtained for transformers have been eight 5,000-kVA and two 4,000-kVA three-phase units for the Central Electricity Board. Export trade is reported to be improving. Contracts have been secured for two 12,500-kVA and two 70,000-kVA transformers with on-load tap changing, for interlinking the 33-kV and 12-kV systems of Cape Town Corporation; switchgear with push-button control is contained in an oil-tight tank mounted on the transformer tank. Other South African orders are a 1,000-kW motor-convertor for Johannesburg Corporation, and motors for the Rand mines. Motors supplied to a hydro-electric company in Canada bring the aggregate capacity of Bruce Peebles 124-kV transformers on this system up to 110,000 kVA.

Revo Cookers in South Africa

The Revo Electric Co., Ltd., has produced a new range of electric cookers, known as the Nos. 7, 9 and 12 "Dominion" series, which are being distributed in the South African provinces by Messrs. C. E. Scott (Pty.), Ltd., of Capetown and Port Elizabeth. This range of models, which incorporates Revo "Superspeed" boiling plates, provides for all sizes of families and has been designed and built upon the knowledge gained in studying the specific cooking requirements of electricity consumers in South Africa. Messrs. C. E. Scott took part in a recent Model Homes Exhibition at Cape Town, and, as the accompanying illustration shows, gave considerable prominence to Revo "Dominion" cookers and the "Superspeed" boiler plate.

A Revo cooker display at a Capetown exhibition

Recent Contracts

British Insulated Cables, Ltd., has just received an order valued at £56,000 from the Madras Government for a power line from Erode to Trichinopoly in connection with the Pykara hydro-electric scheme. This consists of eighty-two miles route length of double-circuit three-phase 66-kV line, and will mean the supply and erection of some 600 lattice masts supporting six-line conductors of 7/0.144 in. aluminium steel-reinforced strand and an earth conductor of 7/10 s.w.g. steel, suspended above the line conductors. The normal height of masts will be 52 ft. and the average span length between supports 750 ft. The line conductors will be supported on suspension insulators consisting of five discs per string, six discs being employed for tension strings at terminal and strain towers.

Among the orders recently received by the Associated Equipment Co., Ltd., is one from the Portsmouth Corporation for trolley-buses of joint manufacture with the English Electric Co., Ltd. Four units are to be of the "66IT" type, of which two will be of the regenerative control pattern, and two of the regulated field control pattern; and two units are to be of the "663T" type, embodying the alternative methods of control mentioned above.

The Australian Government is launching an extensive regional broadcasting service and has placed an order for four new stations of the latest design with the Standard Telephones and Cables (Australasia), Ltd., of Sydney. The four stations will be installed at Launceston, Tasmania; Townsville, Queensland; Sale, Victoria; and Grafton, New South Wales; and each will have a carrier antenna power of 7 kW. The stations will relay programmes originating in the capital city of the State in which the station is situated, and will give service to areas not at present well covered by existing Government stations. Engineers were sent from Australia to England to study the latest broadcast design technique and the stations incorporate many new features. One of the most interesting of these is the entire elimination of all rotating machinery from the plant. The electrical performance of all the stations will conform to European practice, as specified by the C.C.I.R. Standard Telephones & Cables, Ltd., of London, will manufacture the first of these four stations in England, while the remaining three will be made by its associated company, Standard Telephones & Cables (Australasia), Ltd., in Australia. The first station will be put into service in September this year, and the four stations will be completed by the end of 1934.

The Bournemouth Corporation has decided to purchase twelve "Sunbeam" vehicles for use on its trolley-bus routes. The first trolley-buses to be operated in Bournemouth were put into service last May when a trial route between the Square and County Gates was opened. Since then these vehicles have been running daily and as a result of the data obtained in comparison with the other types of transport operated, the Corporation has decided to replace the trams progressively by trolley-buses. It is anticipated that the new route on which the Sunbeam vehicles will operate will be opened in June.

The Scottish Radio Exhibition

The Glasgow Corporation Committee has granted the application of the Radio Manufacturers' Association for the lease of portions of Kelvin Hall from August 27th to September 11th next for a radio exhibition.

Australian Duties on Heating and Cooking Appliances

At the inquiry by the Australian Tariff Board into the tariff on electrical heating and cooking appliances, Mr. I. V. Robinson, of the B.E.A.M.A., said that the average Australian prices were lower than the prices of corresponding apparatus delivered f.o.b. in England. He submitted that the Australian manufacturers had already the protection of delivery charges, primage and exchange and had no need of a protective tariff. He asked that these articles should be admitted free. He referred to the obligation under the Ottawa Agreement that tariffs should be based on the principle that protective duties should be on such a level as would give British manufacturers full opportunity of reasonable competition.

Works Visit

On January 3rd the Osram Lamp Works at Hammersmith were visited by a number of members of the Science Masters' Association, which at the time was holding its annual conference at Kensington. The following day representatives of the Association visited the Lamp Works at Wembley, the G.E.C. Glass Works at Wembley, and the G.E.C. Research Laboratories.

The British Industries Fair

We have now received the special overseas advance edition of exhibitors at the London Section of this year's British Industries Fair and are able to add the following names to the list given in our issue of December 22nd:—

Beard, Percy G.
Belling & Lee, Ltd.
British Broadcasting Cpn.
British National Electrics, Ltd.
British Radiophone Co., Ltd.
Bulgin, A. F., & Co., Ltd.
Dubilier Condenser Co. (1925), Ltd.
Eastick, J. J., & Sons.
Ever Ready Co. (G. B.), Ltd.
General Post Office.
Kamm & Co., Ltd.
Kent Mouldings.
National Lighting Co., Ltd.
Peerless Electrical Mfg. Co., Ltd.
Phœnix Telephone & Electric Works, Ltd.
Redfern's Rubber Works, Ltd.
Rodgers, Joseph, & Sons, Ltd.
Staines Kitchen Equipment Co., Ltd.
Telephone Mfg. Co., Ltd.
Vince's Dry Batteries, Ltd.
Wingrove & Rogers, Ltd.

The Polish Electrical Manufacturing Industry

M. Zygmunt Okoniewski, president of the Polish Union of Electrical Manufacturers, writing in the Warsaw *Gazeta Handlowa*, states that the electrification of Poland and the incidental demand for machines and apparatus experienced a slight revival in 1933. Official statistics show that there was an improvement last year as compared with 1932. The value of the electrical production increased from thirty-nine million zlotys in 1932 to forty-nine millions last year, but as prices declined by about 18 per cent. the growth in the output in 1933 was in reality much larger. With one or two exceptions the Polish electrical industry is not combined into syndicates, and competition compelled makers of electrical machinery and

apparatus to make considerable reductions in prices. The electrical industry has curtailed production, but at the same time has improved the quality of output and extended its programme. For the first time makers began last year to export machinery and apparatus on a large scale, mention in particular being made of large deliveries to Soviet Russia. It was reported from Warsaw on January 3rd that after a satisfactory trial delivery of ten large motors for Russia, the Russian authorities had placed an order with Polish works for a further thirty 600-h.p. motors.

Price Reductions

Siemens Electric Lamps & Supplies, Ltd., announce that the prices of "Full O' Power" "Power" type triple-capacity radio batteries have been reduced.

The General Electric Co., Ltd., has also reduced the price of its 60-V triple capacity h.t. radio battery (catalogue No. L.260).

A Public Clock "Goes Electric"

A number of public timekeepers formerly driven by mechanical movements have recently been converted to electrical operation from the frequency-controlled a.c. supply mains. Amongst these is the clock on Christ Church, North Brixton, London. This timepiece has two very conspicuous dials, mounted on a projecting bracket, and the original movement was a weight-driven, gravity escapement mechanism. This has been replaced by a small synchronous motor-driven unit which utilises the existing dials, hands, and bevel-wheels. Its installation has dispensed with the labour of winding, and has effected a considerable saving of space, while the timekeeping is rendered particularly accurate. The electrical movement is directly connected to the supply mains of the building, and it serves to give accurate time to a large business population. The conversion was carried out by Messrs. Gillett & Johnston, Ltd., of Croydon.

Auxiliary Battery Lighting

The Accumulator Makers' Association has issued a leaflet (No. 5) entitled "A Wise Precaution." It submits that where official regulations require the installation of a system of emergency lighting, independent of the main source of supply, a storage battery provides the best alternative. The advantages of batteries in other cases in which the maintenance of a certain number of lights is essential are also briefly stated.

Joint Electricity and Gas Showrooms

The Doncaster Town Council has decided to purchase property in Hall Gate for conversion into a joint showroom for the Electricity and Gas Departments, and application is to be made to the Electricity Commissioners for the necessary borrowing powers.

E.D.A. in 1933

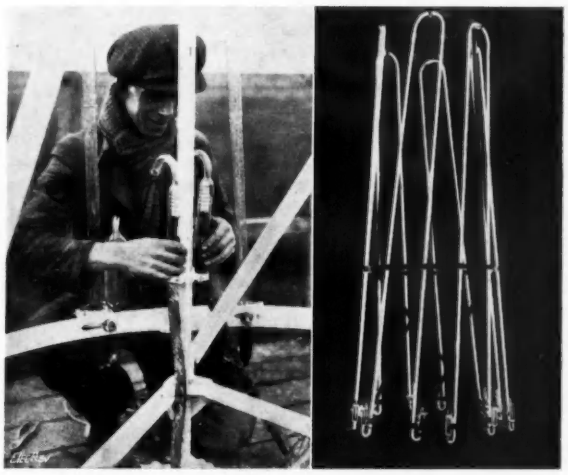
What did the British Electrical Development Association do in 1933? First and foremost to many minds will occur the very difficult and protracted work of reorganising itself, but while all that was proceeding at Council and other meetings the ordinary operations had to be continued in progress with more or less enthusiasm. There were electric cooking and water-heating campaigns in the spring and early summer, and in the last quarter of the year a Press campaign was conducted which may serve as a basis for subsequent efforts. The staff provided the newspaper Press, which is so sadly non-electrical, with editorial matter. The Association organised the electrical section of the Ideal Home Exhibition, with the support of twenty-eight manufacturing firms, and other exhibition activities included the British Industries Fair, the Sanitary Congress at Blackpool, the I.M.E.A. Convention exhibition, and numerous agricultural shows, as well as many local displays. The Association's staff delivered nearly 200 lectures. Sales of local publicity matter, windows displays, &c., exceeded £10,000. The Association's internal publicity, reports by E.D.A. committees, salesmanship and water-heating conferences, courses for women demonstrators, public-speaking competitions, the Building Centre, and the artisan cottage in the Strand—all these, and many other things like them, kept the director, his business manager, and the staff busily engaged while the change of organisation was being planned or carried into effect.

The Danish Market for Radio Apparatus

The Department of Overseas Trade has issued a report by the Commercial Secretary to H.M. Legation at Copenhagen on the market for radio apparatus in Denmark. This states that the popularity of radio in Denmark shows little sign of diminishing, but it would seem that saturation point is being approached. Licences issued total 500,000, or one for every seven of the population. There will, however, be a continued desire to replace old sets by more modern apparatus. The market for radio sets is to a large extent covered by domestic manufacture, and fewer sets are now being imported into Denmark. Although imports of radio material have fallen heavily since 1931, Great Britain's share of the trade available shows a welcome expansion; it rose from 2½ per cent. in 1930 to 23½ per cent. in 1932, the total quantity being 40 tons, valued at kr. 555,000. This increase was well maintained in 1933, and in the first ten months imports from the United Kingdom accounted for over 50 per cent. of the total, the figures being 86 tons of a value of kr. 1,361,000. Mains-operated sets cannot be sold in Denmark without first being examined by the Danish Board of Electricity in Copenhagen and certified that they are "danger proof." The supply pressure in Denmark is generally 220 V d.c., but 220 V a.c., 50 cycles is used in some country districts, whilst 110 V d.c. and 127 V a.c. is also used to a small extent. Denmark's exports of radio material declined from kr. 354,000 in 1930 to kr. 166,000 in 1932.

A Neon Beacon for Aircraft

A neon danger beacon is being constructed by the General Electric Co., Ltd., to the order of the Air Ministry to warn aircraft approaching the wireless masts at the Rugby station. The beacon consists of six hairpin-shaped neon tubes round a tower in the form of a truncated cone, approximately 14 ft. high. The tubes are fed from transformers placed close to the tower, three special single-phase step-up transformers being employed, each feeding two neon tubes. These transformers are of patented design and eliminate the necessity of having series choke coils. Three condensers are employed for power factor improvement. Whilst the beacon can be operated as a fixed light, a flashing mechanism is included in the l.p. side of the a.c. circuit in order that the beacon may flash any morse character. Three switches are also provided for isolating any individual transformer so that should a tube be broken or a fault occur on one phase, the remaining tubes can still be operated.



An aircraft beacon in course of erection at Rugby; and how its finished work will appear

Social Events

The eighth annual sports of the Indian Cable Co., Ltd., were held on the company's recreation ground, Tatanagar, B.N. Rly., India, on December 16th. The events consisted of the usual track and field items. Only one record was broken, the long jump distance being 16 ft. 11 in. After a display of skipping and physical training by daughters of the Indian staff the prizes were presented to the winners by Mrs. E. D. Johnson. The winner of the championship cup presented by Mr. F. W. Leake, was P. K. Sircar, of the wire mill.

Over 900 employés of Messrs. Hoover, Ltd., from all parts of the country and including delegations from the Continent spent an enjoyable evening with their friends at the Great Central Hotel, London, on January 5th, the occasion of the fourteenth annual New Year's party. Lloyd Shakespeare and his band provided dance music. A cabaret included the eight Radio Step Sisters.

An Irish Order for German Equipment

The Allgemeine Elektricitäts Gesellschaft has secured an order to supply the electrical equipment for three sugar refineries in the Irish Free State to the value of a million marks (£50,000 at par). The order includes six turbo-generators and 350 motors.—*Reuter* (Berlin).

A Pocket Electric Fan

We are informed by the Ever-Ready Company (Great Britain), Ltd., Hercules Place, Holloway, N.7, that it is making in this country a pocket fan similar to that described in our last issue (page 18). It is priced at 7s. 6d.

Trade Announcements

Mr. W. T. Carter, electrical and radio engineer, of Rugeley and Smethwick, has opened an additional business at 113, Station Street, Burton-on-Trent.

The telephone number of Messrs. Leslie Dixon & Co., 218, Upper Thames Street, E.C.4, has been changed to "Central 4611."

The Timber Market

Our Timber Trade Correspondent reports that a good 1933 import of European building and joinery woods as well as fairly large supplies of Canadian varieties have rendered stocks large on the market, but consumption has improved, with bright prospects for the early future. Prices are generally steady. Heavy purchases have also been made recently of American hardwoods on the cheaper dollar rate, with little, if any, extra charges as the result of the changed conditions

of labour in the States. There are also fair supplies from Canada and other world sources, as well as of home-grown woods.

Catalogues Wanted

Under this heading we inserted a note last week stating that Messrs. L. Clarke & Co., Ltd., welding specialists, of Southall, Middlesex, required catalogues of *weeding* materials and plant. This was obviously a printer's version of "welding."

The "Beeantee" Illuminations, Ltd., 70, Banner Street, Bunhill Row, E.C.1, asks for catalogues and factors' terms from manufacturers of searchlights, floodlights, motor-driven flashers, and electrical accessories.

Luton Contractors Get Together

Six electrical contracting firms in the Luton district have combined to institute schemes for assisted wiring and the hire-purchase of appliances, and for this purpose have organised a company under the title South Beds Electrical Finance, Ltd. The contractors concerned, who are to be congratulated on their enterprise, are John E. Burrows, the Shoolbred Electrical Co., Ltd., A. T. Snowden and R. J. Stearn, all of Luton, Griffin Bros. (Leighton Buzzard) and Ward & Hubbard (Dunstable).

For Sale

Messrs. Henry W. Figg & Son will sell by auction at Moor Lane, Staines, on January 16th, the plant and machinery of a sand and gravel contractor, including electric motors, cable, &c.

(See our classified advertisements.)

The National J.I.C. for the Electricity Supply Industry

The National Joint Industrial Council for the Electricity Supply Industry has sent us a booklet giving lists of the members of the National and District Councils for 1933-34, members and undertakings within the various areas, and particulars of the functions and constitution of the National Council.

Supervision of Apparatus in New South Wales

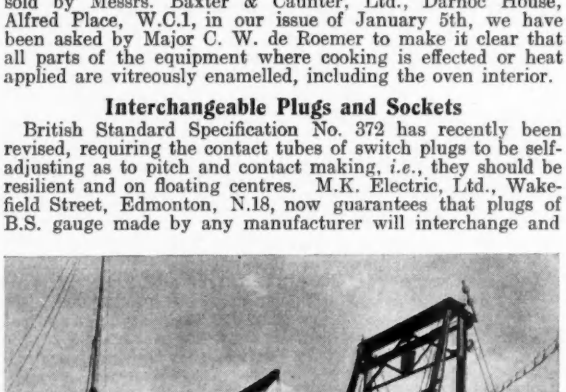
The Government of New South Wales is drafting a Bill to protect the public against faulty electrical apparatus. It will be based on the report of the special expert committee appointed to inquire into the manufacture, sale and use of electrical materials and appliances. Wider powers for the supervision of these articles will be given under the proposed legislation.

A Redesigned Cooker

Referring to the description of the new "Chef-Co" cooker, sold by Messrs. Baxter & Caunter, Ltd., Darnoc House, Alfred Place, W.C.1, in our issue of January 5th, we have been asked by Major C. W. de Roemer to make it clear that all parts of the equipment where cooking is effected or heat applied are vitreously enamelled, including the oven interior.

Interchangeable Plugs and Sockets

British Standard Specification No. 372 has recently been revised, requiring the contact tubes of switch plugs to be self-adjusting as to pitch and contact making, *i.e.*, they should be resilient and on floating centres. M.K. Electric, Ltd., Wakefield Street, Edmonton, N.18, now guarantees that plugs of B.S. gauge made by any manufacturer will interchange and



An electric travelling skip at a London wharf. **(See page 66)**

provide perfect contact with any "M.K." socket base, whether the pins are inserted together or separately. Every carton containing a B.S. socket or switch plugs bears a guarantee seal of universal interchangeability.

B.S.S. for Medium-hard Copper Strip, Bars and Rods

The British Standards Institution has issued a British Standard Specification for medium-hard copper strip, bars and rods for electrical purposes. This Specification is similar in form and scope to Specification No. 444 for plain dead-soft copper strip, bars and rods. It prescribes the minimum conductivity, the tolerances permissible on the dimensions, and the physical properties as shown by tensile, hardness and bend tests. The forms and dimensions of the test pieces are specified, and the procedure for selecting test samples for the electrical and mechanical tests is detailed. In an appendix a table of temperature coefficients of resistance is given. Copies of the Specification (No. 518-1933) can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

New Municipal Showrooms

The Watford Electricity Committee has obtained sanction to borrow £5,300 for the purchase of a site for electricity showrooms, and has asked Mr. W. W. Newman, the borough engineer, to prepare plans for the premises.

A Christmas Gift to the E.I.B.A. Funds

The Christmas cake raffle for the funds of the Electrical Industries Benevolent Association, under the auspices of the Electrical Association for Women, proved very successful. The scheme, originating from Miss Eve Robinson, of the Building Centre, and responded to by demonstrators all over the country, has resulted in a contribution of £51 16s. to the E.I.B.A. funds.

Prices of Materials

Messrs. F. Smith & Co. report, January 10th: No change in the prices of copper (electrolytic) bars and sheets. Copper (electrolytic) wire rods, £43 10s., £1 decrease; copper (electrolytic) h.c. wire, 7d., ¼d. decrease; silicium bronze wire, 8$\frac{3}{16}$d., ¼d. decrease.

Messrs. Edward Till & Co. report, January 10th: India-rubber, Para fine, 4¼d., ¼d. decrease.

Messrs. James & Shakespeare report, January 10th: No change in the price of copper bars (best selected), sheet, and rod. English pig lead, £12 5s., 5s. decrease.

Calendars, Diaries, &c.

A cut-out of one of their electric motors, bearing monthly slips, forms the calendar of Messrs. Crompton Parkinson, Ltd.

Large monthly sheets have been chosen by the City Electrical Co. for its calendar.

The daily calendar of Muller & Co. (England) is mounted on a card with illustrations of the company's screws, nuts, terminals, &c.

Illustrations of mining and material-handling equipment surmount the monthly calendar of British Jeffrey-Diamond, Ltd.

An alluring maiden reclining on the seashore makes a charming picture for "Smiling Through," from a painting by Rolf Armstrong, which heads the calendar of the Supra Electrical Co., Ltd.

The calendar received from the South Lancashire Transport Co. and the Lancashire United Transport & Power Co., Ltd., has illustrations of a tramcar formerly in use, and one of the companies' new trolley-buses.

The colourful picture upon the calendar of the Sloan Electrical Co., Ltd., is entitled "Onward!" and shows an aeroplane in flight at dawn. The monthly sheets have memorandum space on either side.

New Catalogues and Lists

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, N.—A new data book prepared by the Telegraph Construction & Maintenance Co., Ltd., for whose resistance materials the company acts as sole distributor. The book is intended for manufacturers, designers, and others engaged in the manufacture of industrial and domestic electric heating elements, and gives full particulars of "Pyromic" nickel-chromium, and "Calomic" chromium-iron wire, rod and tape.

Revo Electric Co., Ltd., Tipton, Staffs.—A booklet, fully illustrated, describing traffic control equipment, a folder relating to the company's water heaters, and a pamphlet containing brief particulars and illustrations of "Revo" electric domestic table appliances.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.—Publications No. F. and C.6611, giving information on the special features of Fraser & Chalmers heavy oil engines, particularly those designed to overcome the inherent defects of cast-iron construction for large outputs and relatively high speeds.

Isenthal & Co., Ltd., Ducon Works, Victoria Road, N. Acton, W.—List No. V 1133, describing the "M.S." voltage regulator for small and medium a.c. and d.c. generators, booster sets, and small hydro-electric plants, &c. List I.R.134, describing the I.R. voltage controller suitable for outputs up to 7.5 kVA.

Elliott Bros. (London), Ltd., Century Works, Lewisham, S.E.—Catalogue sheets P. 11-14 containing illustrations and particulars of the latest developments in connection with the company's electrically operated speed indicators and recorders for rotating machinery.

Electroservice, Ltd., 31, Waterloo Road, S.E.—A price list of electric lighting fittings, heating pads, bed warmers, &c.

Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester.—List W.700/F, relating to "Fankula" motors.

British Aluminium Co., Ltd., Adelaide House, E.C.4.—A well-produced booklet (No. 357), giving details of aluminium sheet metal work, with a number of excellent illustrations of examples of its applications.

Electric Art Shades (1928), Ltd., Feering Factory, Kelvedon, Essex.—Price list No. 110, illustrating examples of moiré shades.

Brook Motors, Ltd., Empress Works, Huddersfield.—A pocket stock list (No. 372) of electric motors.

British Insulated Cables, Ltd., Prescot, Lancs.—Publication M.18.B.I., containing tabulated particulars of window lead sections, and P.F.115 relating to B.I. condensers for neon sign installations.

Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.—A booklet illustrating some of the ways in which "Neco" motors are applied to a variety of types of light machinery.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 364/8-33, containing illustrated particulars of metal-clad, low-voltage, electrode water-heaters with totally enclosed connectors.

Crompton Parkinson, Ltd., Bush House, W.C.2.—Folder No. E.60313 describing some of the less common uses of the Crompton "A.C. Test."

Bankruptcy Proceedings

W. H. Tweedle (Premier Radio and Electrical Supplies), Paddock Head, Paddock, Huddersfield.—Public examination, February 14th, at the County Court, Huddersfield.

S. Purcell, electrical contractor, The Arcade, Goole, Yorks.—Discharged as from January 5th, 1934.

A. J. Hodges, electrical engineer, 4, Binswood Street, Leamington Spa.—Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham, released November 29th.

E. Whitehouse, electrical and radio engineer, 29, Westfield Street, St. Helens.—Last day for receiving proofs for dividend, January 18th. Trustee, Mr. P. S. Booth, 2, Bixteth Street, Liverpool.

G. D. Whitham, electrical engineer, 86, Orford Lane, Warrington.—Last day for receiving proofs for dividend January 15th. Trustee, Mr. P. S. Booth, 2, Bixteth Street, Liverpool.

T. A. J. Edmunds (Essanee Radio & Electrical), wireless dealer, 5, Lena Gardens, Hammersmith, W.—Receiving order made January 3rd, on a creditor's petition. First meeting, January 15th, and public examination March 7th at Bankruptcy Buildings, Carey Street, W.C.

J. H. K. Reynolds, wireless dealer, 208, High Street, Poole.—Receiving order made January 2nd on debtor's own petition.

A. E. Douch and **M. G. Willis,** radio and electrical engineers, 109, High Street, Dover.—Receiving order made January 1st on debtors' own petition. First meeting, January 13th, at 1, The Parade, Canterbury. Public examination, January 23rd, at the Guildhall, Canterbury.

A. C. Gardner, wireless dealer, 7, Midland Road, Derby.—Discharge suspended for twelve months until November 22nd, 1934.

C. G. Lowe (Tele-Radio & Electrical Supplies), radio and electrical dealer, 132, Burton Road, West Didsbury, Manchester.—First and final dividend of 7½d. in the £, payable January 12th, at the Official Receiver's offices, Byrom Street, Manchester.

J. Mellanby, electrical engineer, Mystery House, Cambridge Road, Waterbeach, Cambs.—First and final dividend of 9½d. in the £, payable January 15th, at 41, Sidney Street, Cambridge.

Company Liquidations

Fredk. Hodgson & Co., Ltd., 11, Poultry, E.C., electrical engineers.—The statutory meeting of creditors was held on January 8th in London, when Mr. Hodgson, one of the directors of the company, presided, and said that the business was started by him over forty years ago. According to a statement of affairs the liabilities amounted to £1,147, of which £1,003 was due to the trade, and the landlords were creditors for £145. There was a deficiency of £251. The accountant explained that up to December, 1930, the company was able to pay its way, but since then difficulties had been experienced. The company was incorporated in 1919 and the working capital throughout had been in the neighbourhood of £500. During 1930 and 1931 losses were made which were due to trade depression and losing money on two contracts which had been undertaken during those years. He said that the company had been financially embarrassed since the middle of 1931, and on December 13th last the General Electric Co., Ltd., issued a writ for over £100, and, as the company was not able to satisfy the amount, it was decided to pass the necessary resolutions for voluntary liquidation. The approximate turnover for the last three years had been at the rate of £4,000 per annum. The shareholders nominated Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., as liquidator, and the creditors confirmed his appointment, with a committee of inspection. The following are creditors: General Electric Co., Ltd., £118; Gent & Co., Ltd., £114; E. Marshall, Ltd., £120; Sun Electrical Co., Ltd., £52; William White & Co., £315.

Clifford & Snell, Ltd., electrical engineers, Sumner Road, West Croydon.—The statement of affairs lodged under the compulsory liquidation of this company shows liabilities of £1,653, assets of £804, and a deficiency of £3,549 as regards contributories, the issued capital amounting to £2,700. The Official Receiver, who is also acting as liquidator, reports that the company was registered as a private company in November, 1928, and acquired from F. S. Clifford and A. E. C. Snell certain patents and the vendors' interests in a lease of the Sumner Road premises, the consideration being £150 in shares. The patents related to inventions for improvements to the electrical transmission or reproduction of sound, loud-speaking receivers, and sound transmission and reproduction by electrical means. These patents were incorporated in the company's productions, which were in the main telephone installations with loud-speaker attachments for use in noisy situations. The company used the trade name of "Loudaphone." The accounts show a gross profit throughout, but a net loss of about £4,300. The failure is attributed to lack of sufficient capital to carry the company over the experimental and development period and to dissensions between the creditors.

Electro Magnetic Controls, Ltd.—Winding up voluntarily. Liquidator, Mr. C. D. Britten, 16, John Dalton Street, Manchester.

Ellancee Radio, Ltd.—Particulars of claims by January 31st to the liquidator, Mr. W. H. Warren, 72A, St. Peter's Street, Derby.

Park Radio & Engineering Co., Ld.—Meeting, February 8th, at 4, Parkshot, Richmond, Surrey, to receive an account of the winding-up by the liquidator, Mr. J. W. Sears.

Rotax, Ltd.—Meeting, February 9th, at 71, Edmund Street, Birmingham, to receive an account of the winding-up by the liquidator.

Electricity Supply

Lighting, Domestic, Power

Aldershot.—ASSISTED-WIRING SCHEME.—The Town Council has approved an assisted-wiring scheme in principle. Subject to the approval of the Electricity Commissioners, the scheme will be based on the undermentioned rates: Flat rate of 5d. per kWh for lighting; a prepayment meter and assisted wiring each being 1d. per kWh extra.

Australia.—PERTH POWER HOUSE ADDITIONS.—The Treasurer of Western Australia has announced that it is proposed to purchase the equipment required for the extension of the East Perth power station by the issue of debentures repayable over fifteen years. Manufacturers who will be tendering for the supply of the material have indicated that this method will be acceptable to them. Tenders will be invited when the loan has been approved by the Loan Council, and the letting of tenders and consequential negotiations should be completed by April.

Blackpool.—NEW TRANSFORMER SUB-STATIONS.—The Electricity Committee is to acquire four additional sites for transformer sub-stations in the Marton district.

Cardiff.—CHANGE-OVER.—The Electricity Committee has decided to effect a further change-over of supply in the town centre at a cost of £28,770.

ELECTRICITY FOR THE MARKET.—The Markets Committee has asked the city electrical engineer to quote for the installation of electricity in the Canton Market.

Carlisle.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at Hawksdale at a cost of £560 and at Bunkers Hill at £430.

Clacton-on-Sea.—STREET LIGHTING.—Considerable improvements have been made during the past few months in the lighting of the streets of the borough. The Council has installed the major portion of a scheme which, when completed, will prove an excellent example of efficient and economic street lighting. The initiation of the scheme in Pier Avenue and Station Road having proved satisfactory, it has been adopted for all the main thoroughfares. This equipment consists of totally enclosed dustproof refractor units with 300-W gasfilled lamps, mounted over the centre of the road 19 ft. high, supported by steel columns and extending brackets spaced at 45-yd. intervals. They were specially designed and supplied by the Revo Electric Co., Ltd., and the installation was carried out under the supervision of Mr. G. Broadhurst, the borough electrical engineer. The accompanying illustration shows the excellence and the uniformity of the illumination. Proposals are being considered for decorative schemes in conjunction with the lighting units, gardens, and architectural feature along the promenade.

Revo street-lighting equipment at Clacton-on-Sea

Colne.—CLOSING OF PHILLIPS LANE STATION.—With the introduction of the new electricity scheme Phillips Lane generating station is closing down. This will not involve staff dismissals.

Chatham.—ELECTRICALLY HEATED BATHS.—A committee is to pay a visit to the new electrically heated swimming baths at Watford with a view to adopting the same method.

Croydon.—PROGRESS DURING 1933.—Mr. F. N. Rendell-Baker, the borough electrical engineer, informs us that the total energy generated by the Corporation electricity undertaking for the year ended December 31st, 1933, amounted to 148,104,020 kWh. During the same period the maximum demand on the generating station rose from 38,100 kW to 42,920 kW. Energy "exported" to the Central Electricity Board during this period amounted to 53,708,700 kWh, and 4,738 new consumers were connected during the year as compared with 3,828 in the previous year.

Czechoslovakia.—ELECTRICITY SUPPLY PROGRESS.—Figures published in the *Electrotechnical Yearbook* show the development of Czechoslovakia's electricity supply up to and including the year 1932. The total consumption in 1930 was 3,065 million kWh, but in 1931 there was a fall to 2,917 million.

and in 1932 a further decline to 2,670 million. Almost all this power was supplied by home concerns, only 18,000 kWh being imported in 1932. The bulk of the electricity is produced by factory and other private power stations. The network of cables in 1932 totalled 31,820 km. (roughly 20,000 miles), compared with 30,821 km. in 1931. Of the total population of the country as recorded at the last census, that is, 13,600,000, over 10,500,000 live in parishes which are supplied with electricity. The 643 public utility concerns supply parishes with a population of over 7,500,000.

Darlington.—TWO-PART TARIFF.—The Town Council is again to give consideration to a two-part tariff scheme promoted by the Gas and Electricity Committee and referred back at the Council's last meeting. The fixed charge will be based on the number of assessable rooms in the house. A scheme which has been drawn up shows that the charge for a three-roomed dwelling would be 5s. 10d. per quarter and for a fifteen-roomed house 35s. a quarter. Consumers have the option of being charged on the new scale or by the method now in use.

Docking (Norfolk).—AN EARLY SUPPLY.—The East Anglian Electric Supply Co. has announced that a supply will be available in Docking and Sedgeford during this month.

Doncaster.—ELECTRIC STUNNING FOR PIGS.—The Town Council has decided to use electrical appliances for stunning pigs before slaughter at the municipal slaughter houses.

LOAN SANCTIONED.—The Council has received sanction to borrow £30,000 for unspecified extensions of electriicty mains and services and for sub-station plant and new e.h.p. feeders to the Balby and Waterdale sub-stations.

Erith.—EXTENSIONS.—The Urban District Council has decided to carry out cable extensions, with sub-stations and equipment, public lighting, &c., on the new housing estate at West Heath, at an estimated cost of £30,000.

Finchley.—NEW SUB-STATION.—The Electricity Committee is to obtain a site at the Hampstead Garden Suburb for the erection of a sub-station.

MAINS EXTENSION.—Mains are to be extended at a cost of £884.

Finland.—NEW POWER STATION.—A power station with a capacity of 65,000 h.p. is to be built in Southern Finland to harness the water power of the Rouhiala Falls and the rapids system of the Kymmene Valley. It is estimated that the building and equipment of this station will cost £776,000. The work is to be carried out by private enterprise, and a company has been formed for the purpose. When completed, this station will supply electricity to factories in the Kymmene Valley.—*Reuter* (Helsingfors).

Fleetwood.—LOAN.—The Council is applying for sanction to a loan of £10,000 for the purchase of electrical appliances.

France.—POWER SUPPLY INTERCONNECTION IN PARIS.—At a recent conference in Paris, a lengthy report was presented on the progress which has been made in linking up the power stations of the various electricity supply undertakings in the French capital so that they may come to the aid of one another in case of breakdown at any one plant, or when an abnormal increase in the load is experienced in a particular district. At the present time there are eight generating stations in and about Paris with an installed plant capacity of approximately 1,200,000 kVA, all of them being now interconnected by underground transmission lines, and, through a transformer station at Chevilly, with the 90-kV and 220-kV transmission lines extending from generating stations in Central France.

Glasgow.—ELECTRICITY AT ABATTOIR.—The Markets Committee is to purchase electric lethalors for stunning pigs at the municipal abattoir, and if these prove satisfactory this method will be adopted generally.

PROGRESS DURING NOVEMBER.—Under the Corporation's scheme, 138 houses were wired in November, making the total to date 38,380, and hired appliances numbered thirty-four, making the total 17,593.

MAINS EXTENSIONS.—The Corporation Electricity Committee has agreed to the laying of distributing mains at a cost of £6,518.

PROTEST AGAINST PROVISIONAL ORDER.—At a recent meeting of the Corporation Parliamentary Bills Committee there was submitted a copy of the Clyde Valley Electrical Power Co.'s Provisional Order, the purpose of which is to confer further powers on the company relating to the laying of pipes and the acquisition by the company of generating stations, &c., and to extend the company's area of supply in the counties of Lanark and Dumbarton. The Committee recommended that a petition against the Order should be lodged to protect the interests of the Corporation.

Gorseinon (Glam).—REDUCED CHARGES.—The Gorseinon Electric Light Co., Ltd., has reduced its charges, as follows: Lighting, from 8d. to 6½d. per kWh.; heating and cooking, from 2d. to 1¾d.; and power, from 2½d. to 2d. The all-in domestic rate has also been reduced.

Gravesend.—LOAN.—The Electricity Committee is to apply for sanction to borrow £40,000 for mains and services.

CHANGE-OVER.—The Electricity Committee is to undertake a further change-over at a cost of £2,200.

Guildford.—SUPPLY TO HOLMBURY ST. MARY.—The Rural District Council has given its general consent for the supply of electricity by the London and Home Counties Joint Electricity Authority to consumers at Holmbury St. Mary, which is beyond the area of supply of the Authority, and within the supply area of the Guildford Corporation.

Hebrides.—ELECTRICITY AT LONG ISLAND.—The electric plant on Long Island, which embraces North and South Uist and the islands of Benkecula and Barra in the Outer Hebrides, has recently been installed by Mr. J. Maclean, proprietor of Castlebay, Barra.

Hull.—LOANS.—The Electricity Committee has obtained sanction to a loan of £75,000 for mains and services, £21,600 for sub-stations and equipment, and £15,000 for meters.

Ilford.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £50,000 for mains, £10,000 for wiring, and £35,000 for domestic apparatus.

India.—EXTENSIONS AT DELHI.—A report in *Indian Engineering* states that schemes for the extension of electricity to the villages lying round about Delhi are being considered by the authorities concerned. Of these, the one concerning the Qutab, Mehrauli and Hauz Khan is being actively considered, and it is expected that power will be extended to these places in a few months' time. Another scheme proposed is the extension of power to Gurgaon, Shikarpur, Basti, Narela, Sonepat and other surrounding villages with a view to their ultimate linking up with the Punjab hydro-electric scheme. These schemes are expected not only to give better lighting facilities, but also to help cultivation to a great extent. The Mehrauli scheme will cost about Rs. 1 lakh, and it is thought that there must be a large consumption for irrigation purposes if the supply is cheap and adequate. The existing sources of supplies for Delhi at present are two power stations, one in Delhi worked by a private company and the other worked by the New Delhi Municipality and situated outside the Delhi Gate on the banks of the river. The capacity of the municipal power house is about 6,000 kW and that of the other about 3,000 kW. If the new schemes are taken up, the capacity of the municipal power house will have to be considerably increased.

MYSORE.—The Department of Industries has been conducting experiments in connection with the production of electrical energy by means of internal-combustion engines driven by producer gas. Large quantities of charcoal for this purpose are available in Mysore. The results of these experiments are considered satisfactory, as it has been found possible to generate power in small and medium-sized plants at a cost of about one anna per kWh. There are a number of localities in Mysore where the demand for power is insufficient and the distance from the hydro-electric grid is too great to justify the laying of feeder cables, &c., but where, nevertheless, producer gas plants might profitably be installed for the supply of electric power to minor industries.

Iraq.—BOYCOTT OF BRITISH POWER STATION.—A *Reuter* message from Baghdad says that, although exceptional measures have been taken by the Iraq Government, the boycott of the British-owned electric power company still continues. Hundreds of shopkeepers and householders still refuse to use electricity, and the Christmas and New Year displays in the vast majority of the shops were poorly illuminated by feeble oil lamps. The Government has now banished six of the principal organisers of the boycott to Iraqi Kurdistan, and there is talk of a general strike as a retaliatory measure. Approximately £250,000 of British capital has recently been invested in the electricity company. The new Baghdad power house was built only last summer, and had hardly commenced production before the boycott was declared, the complaint being that the charge of 6½d. per kWh was excessive.

Kingston-on-Thames.—LOANS.—The Town Council has applied for loans of £6,000 for mains and £3,000 for meters.

Latvia.—HYDRO-ELECTRIC PROJECT.—It is announced that the Ministerial Council of Latvia has decided to break off the negotiations with a French firm (Sainrapt and Brice) with regard to the construction of the long projected hydro-electric works on the Dvina, as the proposals of the firm are said to have been unacceptable to the Government. The French firm was to have undertaken the work and received payment in the form of the delivery of timber from the State forests. The Riga correspondent of the Amsterdam *Telegraaf* states that a representative of an English banking syndicate, acting on behalf of the American Foundation Company, is to arrive at Riga to enter into negotiations with the Government concerning the financing of the proposed Dvina hydro-electric works. It is reported the Government of Latvia is to be granted a loan of 52 million lats at the rate of 6 per cent. and an issue price of 92 per cent., redeemable in 25 to 30 years, on the following conditions: (1) Machines of the value of 14 million lats must be purchased in England; (2) a monopoly of the tobacco industry is to be granted as security for the loan; and (3) finally, it is demanded that a settlement should be made of the pre-war debt of the city of Riga to the English concern of Lazard Brothers.

Leeds.—SUB-STATION.—The Electricity Committee has obtained a site in Easterley Grove, Harehills, for the erection of a sub-station.

Liverpool.—LOAN SANCTIONED.—Sanction has been obtained by the Electric Power and Lighting Committee to the borrowing of £200,000 for mains and services in connection with the change-over from d.c. to a.c.

EXTENSIONS.—A supply of electricity from the Liverpool

system is to be given to the Aughton district. The cost, including the erection of four pole transformers, is estimated at £4,044.

London.—SOUTHWARK.—The Electricity Committee recommends that application be made for sanction to the borrowing of £10,000 as a provisional estimate for free-wiring schemes to be undertaken in the future.

Malvern.—MAINS EXTENSIONS.—The Urban District Council has decided to extend the duplicate feeder to Albert Park Road at an estimated cost of £527 10s., and to lay a new 200 V cable to supply the Link Picture House (£272.)

Middleton.—EXTENSION PROPOSAL REJECTED.—The Town Council has rejected a recommendation by the Electricity Committee to give a supply of electricity to the Stakehill area at an estimated cost of £820, owing to the lack of demand.

Much Wenlock (Salop). — ELECTRICITY WANTED. — The Borough Council has decided to ask the West Midlands Joint Electricity Authority to canvass the town with a view to supplying electricity.

Nelson.—LOAN.—The Corporation is applying for sanction to borrow £8,000 for the provision of new mains and services.

New Zealand.—AUCKLAND.—The Auckland Electric Power Board purchases its energy from the Arapuni hydro-electric station which started operation again on April 15th, 1932, after being out of action for nearly two years. Statistics of the working of the Board for the years ended March 31st, 1932 and 1933, show a slight falling off in the amount sold (125,527,959 kWh in 1933, 126,427,783 in 1932), but an increase in the net surplus from £775 to £33,080. Working costs per kWh sold were 0.6614d. as compared with 0.7096d., the revenue per kWh being 1.2164d. (1.237d. in 1932). The number of consumers increased from 48,043 to 49,097, there being a considerable increase in the power load.

Perthshire.—SUPPLY WANTED.—The County Clerk is asking the Grampian Electricity Supply Co. to give favourable consideration to a request for a supply from Burrelton and Woodside.

Plymouth.—MAINS EXTENSIONS.—The Electricity Committee is to lay cables at a cost of £1,695.

Portsmouth.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £4,500.

LIGHTING.—The Committee is to install luminous tube lighting at Farlingham, at a cost of £950, as an experiment.

Scotland.—GRAMPIAN SCHEME.—With the completion of a second power house at Tummelbridge, Lochs Ericht and Rannoch have now been harnessed in connection with the Grampian Electricity Supply Co.'s hydro-electric schemes in Perthshire. At the outlet of the river Tummel from Loch Rannoch a control weir has been constructed to regulate the water level of the loch and give an average depth of storage of 8 ft. There are also four automatic syphons to keep the water level from rising more than a limited amount during floods. The power house is a solid steel framed structure, 175 ft. in length by 90 ft. It contains two horizontal generating units, each composed of a Francis turbine. A 132 kV transmission line from the Rannoch power station transmits the energy to the Central Electricity Board's distributing station at Abernethy. Over the tail race into the River Tummel a concrete bridge has been constructed to carry the public road.

Southport.—SUB-STATION.—The Electricity Committee has agreed to purchase land in Nelson Street as a site for a sub-station.

MAXIMUM DEMAND TARIFF.—The Electricity Committee has decided that the maximum-demand tariff for the lighting of business premises shall be calculated on half-yearly readings of the maximum demand indicators instead of annual readings, and that the discount allowance for prompt payment of accounts shall be increased from 5 per cent. to 10 per cent.

South Shields.—ASSISTED-WIRING SCHEME.—Application is to be made by the Town Council for sanction to borrow a further £3,000 for the assisted-wiring scheme.

SUB-STATION.—The Town Council proposes to build a sub-station on the Stanley Terrace housing estate.

CONVERSION OF PLANT.—The Electricity Committee has instructed the electrical engineer to convert the 1,000-kW d.c. generator at the generating station into a motor-generator at a cost of £600 in order that it may be used as a standby. The generating station is being closed down at the end of February consequent upon the Central Electricity Board taking over the supply.

Stoke-on-Trent.—SUPPLY EXTENSIONS.—The Electricity Committee is to provide an additional supply at a cost of £900 to Messrs. W. H. Grindley & Co., Ltd., at the Woodland Pottery, Tunstall, and to the new tileries of Messrs. Downing & Callcott at Bradwell Wood (£700). The Committee is also to provide a supply, costing £680, to ninety-four houses being erected by the Newcastle Corporation at Little Dimsdale.

Stratford-on-Avon.—EXTENSIONS.—The Rural District Council has decided to offer no objection to an extension by the Leicestershire, Warwickshire Electric Power Co., Ltd., of the overhead lines from Kineton to Fenny Compton, and also for the distribution of electricity by overhead wires in the village of Ullenhall. The Leamington & Warwick Electricity Co. has offered to supply electricity to Council houses in Warwick Road, Kineton Road, and Stratford Road, Wellesbourne, at a charge of £1 per house, using overhead lines.

Sutton Coldfield.—SUPPLY IMPROVEMENTS.—The Electricity Committee is to improve the supply in the Chester Road area at a cost of £733. And extend mains and erect a sub-station in the Walmley district at a cost of £3,027.

Swansea.—HIRE OF APPARATUS.—The Electricity Committee has adopted a scheme for the hiring out of domestic apparatus. It is proposed that cookers, wash-boilers, water-heaters and immersion heaters should be hired out on the basis of 10 per cent. of the cost of the apparatus, plus the cost of installation. A loan of £20,000 to cover the cost of the scheme is to be applied for.

Ulverston (Lancs).—EXTENSION.—The Urban District Council has approved a scheme for the extension of the electricity supply to Rosside.

Usk.—SPECIAL ORDER.—The South Wales Power Co. has applied to the Electricity Commissioners for an Order extending its area of supply to include the urban district of Usk.

Wakefield.—LOAN.—The Electricity Committee is to apply for sanction to borrow £5,000 for sub-stations and transformers.

ELECTRIC CLOCKS.—The Corporation is to provide electric clocks at the Town Hall.

Watford.—RECONDITIONED COOKERS.—The Electricity Committee has decided to recondition obsolete cookers and hire them out at reduced rates.

West Ham.—LOAN.—Application has been made for a loan of £126,645 for extensions and equipment.

Wimbledon.—PROGRESS DURING 1933.—Mr. A. E. McKenzie, chief engineer and manager of the Corporation electricity undertaking, informs that the "output" of electrical domestic appliances by the undertaking for the year ended December last was far greater than that for the preceding year, which was a record at that time. The following table shows the net output of the various appliances during the year, and the total at December 31st:—

Appliances.	Net output for 1932.	Net output for 1933.	Increase.	Percentage increase.	Total at Dec. 31st, 1933.
Cookers	584	774	190	32.5	4,951
Water heaters	596	1,339	743	124.6	3,664
Wash boilers	125	215	90	72.0	1,418
Irons	125	466	341	272.8	5,270
Kettles	409	686	277	67.7	4,263
Fires	481	1,063	582	120.0	5,579
On hire purchase (miscellaneous)	653	721	68	10.4	3,424
Totals	2,973	5,264	2,291	77.0	28,569

Wolverhampton.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to the new housing estate at Cannock Road (£7,330), and extend mains to Finchfield and the New Pennestate (£950).

Woolwich.—MAINS EXTENSIONS.—The Town Council has decided to proceed with the laying of a 22,000-V cable from Woolwich to Plumstead at a cost of £18,159.

Worksop.—ELECTRIC LIGHT FESTIVAL.—The Electricity Committee, subject to the approval of the Council, proposes to hold an "electric light festival," divided into two parts, the first beginning in April and lasting for six weeks, and the second in the autumn. An elaborate scheme of illuminations and floodlighting is being prepared by Mr. M. S. Mason, the borough electrical engineer.

Worthing.—HEATING OF PAVILION.—The Parks Committee has considered the type of hot water system to be installed in the sports pavilion in the Manor sports ground. The three schemes are:—(1) Gas-heated "Califonts" (one to each pair of dressing rooms), costing £110; (2) two gas-heated boilers placed in the basement with a circulating system and hot-water cylinder and cold supply tanks, costing £155; and (3) two electric water heaters—one at each end of the pavilion with cold water service from a supply cistern and hot water services run from heaters placed in cupboards provided in dressing rooms to showers and wash basins. The advantage of the last-named system is that the temperature of the water can be adjusted as in scheme (2), whilst the disadvantages are that the heaters require to be put in operation about two hours before water is required; more water may be heated than actually necessary, and the cost of heating water electrically is more than by gas. The estimated cost is £146. Messrs. Benhams state that in their experience, taking gas at 4s. per 1,000 feet, or 9s. 6d. per therm, and electricity at 1d. a kWh, the cost of heating water by electricity is approximately double that of gas. In view of the fact that very little hot water is required and consequently the consumption of electricity will be relatively small, and anticipating a probable reduction in the price, the Committee recommends acceptance of scheme 3.

York.—SUB-STATIONS.—The Electricity Committee has obtained sites at Walmgate and Haxby for the erection of sub-stations.

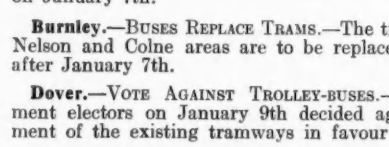
Traction

Birmingham.—TROLLEY-BUSES.—The new service of trolley-buses on the Coventry Road route was brought into operation on January 7th.

Burnley.—BUSES REPLACE TRAMS.—The trams running in the Nelson and Colne areas are to be replaced by buses on and after January 7th.

Dover.—VOTE AGAINST TROLLEY-BUSES.—The local government electors on January 9th decided against the abandonment of the existing tramways in favour of trolley-buses.

Jugo-Slavia.—ELECTRIFICATION PROJECT.—The *Deutsche Bergwerks Zeitung*, quoted by *Reuter's Trade Service*, says that the Council of Towns has decided to appoint a committee of experts to prepare a scheme for the electrification of the country, including the national railway system, for submission to the Government. Two French firms, it is reported, have already made tenders for the erection of power stations and the electrification of the railways, and the Government views the projects with favour.



This unusual form of two-colour traffic signal is being installed in the streets of Rome

New Zealand.—WELLINGTON.—Statistics for the operation of the city trams during the two years ended March 31st, 1933, show a decrease in tram mileage from 4,130,110 to 4,075,375, and in passengers from 38,278,552 to 35,102,247. The revenue per car-mile was 20.76d. (as compared with 22.03d.) and the working cost 14.5d. (15.95d.), the net deficit increasing from £9,683 to £12,589.

Russia.—TRAMWAYS IN MOSCOW.—Next year the Moscow Tramway Trust intends to overhaul its rolling stock thoroughly. About 1,500 cars are to be rebuilt, one and a half times as many as in 1933, and fitted with a mechanical device for lubricating the rails and tyres; up to the present the rails have not been greased; this has meant rapid wear and a large number of replacements. Half the existing hand-worked switches are to be replaced by the automatic type manufactured by the Svarz Trust and the switch works. As a result of this change the staff of pointsmen will be reduced. —*Reuter's Trade Service* (Moscow).

Salford.—TRAMWAY ABANDONMENT.—The City Council is to abandon the tramways in the Swinton and Pendlebury Urban District Council's area as the cost of reconstruction would amount to £45,000. Motor buses are to be substituted until the Corporation is in a position to provide trolley-buses.

Sheffield.—OBJECTION TO PROVISIONAL ORDER.—The Sheffield Parliamentary and General Purposes Committee has decided to lodge formal objections to the Rotherham Corporation (Trolley Vehicles) Provisional Order.

Traffic Signals.—The Birmingham Watch Committee has approved of a scheme for the erection of automatic traffic signals in Corporation Street at the junctions of New Street and Bull Street at a cost of £803.

The Walsall Corporation is to install traffic signals at an estimated cost of £405, and the Ilkeston Highways Committee recommends the provision of automatic traffic signals at two junctions at a cost of £872.

The Wakefield Corporation is to provide automatic traffic signals at four junctions at a cost of £1,160, while it is proposed to erect automatic traffic signals of the trip-control type at the junction of main thoroughfares in Kettering.

Turkey.—ELECTRIC RAILWAY PROJECT.—There is a scheme for building an electric railway in Turkey for the conveyance of coal from the Eregli-Songuldak field and to connect with the Angora-Filios line. It is estimated that when the port works at Eregli are completed in about five years' time over 1,000,000 tons of coal will utilise that outlet by means of the new electric railway. The present output of the mines is at the rate of 1,600,000 tons annually, but this is expected to be increased to 2,000,000 tons shortly and to 3,000,000 tons in five years. About £T4,000,000 (£500,000) is estimated as the cost of constructing the fifty-three miles of railway between Eregli and the most convenient point on the line to Filios, more than half this sum being needed for the power station. This would be steam driven and would use a large quantity of coal dust which at present is wasted.

Communications

France.—PHOTOTELEGRAPH SERVICE WITH ROME.—The Minister of Posts, Telegraphs and Telephones has opened a public phototelegraph service between Paris and Rome. The fee, which is calculated on the measurements of the image to be transmitted, is 1.85 fr. per sq. cm., with a minimum of 185 fr. Phototelegrams will be accepted at all French post offices.—*Reuter's Trade Service.*

Great Britain.—The B.B.C. has published a brochure entitled "The Lucerne Plan," which will be supplied free to any listener who requires information concerning the changes in the wavelengths of all British transmitters which take place on the night of January 14th/15th. At the conclusion of its programme on Sunday night, January 14th, every European broadcasting station will change its wavelength and all transmitters will be working on their new wavelengths on the following day. The pamphlet gives a brief history of international events which have created the need for a new wavelength plan, a complete copy of the Plan itself with the names of all European broadcasting stations, together with their new wavelengths and powers, and, finally, advice to any listeners who may find themselves in difficulty in receiving British stations satisfactorily on or after January 15th. So far as the British stations are concerned, the changes in wavelength are very small (with the exception of Bournemouth) and it is not anticipated that there will be any serious difficulty.

POST OFFICE STATISTICS.—During 1932-33 telegraph receipts amounted to £6,300,000, and the number of inland telegrams declined by 1,190,000 to 36,041,000. Telephone receipts totalled £24,000,000. Local calls increased by 55,500,000 to 1,360,500,000, while the number of trunk calls rose by 8,351,000 to 128,813,000; international calls declined by 56,000 to 1,171,000. Broadcast radio receiving licences increased by 877,000 to 5,497,000.

RADIO RELAY SERVICES.—Ilford Corporation has reappointed a sub-committee to report upon the granting of licences for the installation of wireless relay services in the borough.

A special sub-committee of the Manchester Corporation has visited Hull and inspected the relay system in operation in that city, which has 15,000 subscribers. The company allows the Corporation 10 per cent. of the receipts, which represents about £5,000 per annum. The committee found little to complain of regarding wires crossing the streets, but considers that it would be desirable for the Corporation to have a clause in tenancy agreements prohibiting the use of poles, as affecting the amenities of a district. The committee interviewed a number of radio retailers, and has come to the conclusion that notwithstanding the inducement of substantial revenue to the corporation, the granting of any concession would create a monopoly and would be injurious to the trading of shopkeepers, and it therefore cannot recommend the granting of a concession for the Manchester area.

The Southampton Town Council has decided not to allow any relay system in the borough.

The Wood Green Corporation Housing Committee recommends that Wired Wireless, Ltd., shall be allowed to affix brackets and wires to houses on the Council's White Hart Lane Estate subject to the same terms as those appertaining to the Durnsford Road Estate.

Great Western Railway.—TELEPHONY AND TELEGRAPHY.—In its annual review of 1933, the Great Western Railway Co. reports that the blizzard in February last caused extensive damage to the company's telegraph and telephone service. The emergency requirements were such that stocks of material kept for this purpose were exhausted within a few hours, with the result that purchases of large quantities of cables, wires, telegraph poles, &c., had to be made. The "carrier" telephone apparatus, which had previously operated only between Paddington and Bristol, was extended during the year from the latter place to Cardiff. Further "Creed" high-speed direct printing telegraph apparatus was installed during the twelve months, the circuits now operating between (1) Paddington and Cardiff, (2) between Newport, Cardiff General and Cardiff Queen Street, and (3) between Cardiff General and Swansea.

Liverpool.—SHIPS' DIRECTION FINDERS.—Messrs. Alfred Holt & Co. are to fit all their Blue Funnel ships with radio direction finders, of which seventy have been ordered from the Marconi International Marine Communication Co., Ltd.

Northern Ireland.—NEW REGIONAL STATION.—The site for the new Northern Ireland Regional station has been settled by the B.B.C. and the station will be erected at Blaris, Lisburn, about ten miles west of Belfast. It will replace the low-power Belfast transmitter. The new station will have a power of 150 kW; the area served will be between sixty and seventy miles, and its programmes will easily reach the farthest point of Northern Ireland, covering also the city of Belfast and the thickly populated valley of the Lagan.

United States.—RADIO-TELEGRAPH SERVICE TO SPAIN.—A direct radio-telegraph service between Spain and the United States has been inaugurated by the Mackay Radio Co., a subsidiary of the International Telephone and Telegraph Corporation. In January last direct radio communication was established with the Vatican City; in May an extension of the Mackay radio service was made to Shanghai; and in November a service started between New York and Copenhagen.—*Reuter's Trade Service* (New York).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Argentina.—BUENOS AIRES.—January 25th. State Oilfields. Motors and transformers, with switch and control gear (A.Y. 12141.)*

Australia.—MELBOURNE.—Post and Telegraph Department. January 23rd. Telephone trunk test boards. (A.Y. 12091.)*
January 30th. Telephone handsets. (A.Y. 12113.)*
February 6th. Telephone induction coils and registers. (A.Y. 12127.)*
BRISBANE.—January 31st. City Electric Light Co., Ltd. Land and submarine cable. (A.Y. 12072.)*
February 7th. 44-kV switchgear. (A.Y. 12092.)*

Belfast.—January 19th. Electricity Department. Stores for twelve months commencing April 1st. (December 29th.)

Belgium.—BRUSSELS.—February 23rd. Municipality. Supply and installation of a 20,000-kW steam turbo-generator. Particulars and plans (125 fr.) from 11, Rue Ste. Catherine.

Blackpool.—January 22nd. Corporation. Stores, materials, &c., for 1934-35. (January 5th.)

Burton-on-Trent.—January 31st. Corporation. Underground and overhead cables. (January 5th.)

Dumfries.—January 23rd. Town Council. Various works, including electrical, in forty-four houses at Nithside. Specifications, &c., from Burgh Surveyor, tenders to Town Clerk.

Dundee.—January 15th. Corporation. Heating installation at alterations and additions to Central Police Station. Particulars from City Quantity Surveyor, 21, City Square; tenders to Town Clerk. Electric lighting installation at Central Police Station. Particulars from City Architect; tenders to Town Clerk.

Edinburgh.—January 25th. City Council. E.h.p. switchgear for Portobello power station. (January 5th.)

Egypt.—ALEXANDRIA.—February 26th. Ministry of Communications. Cable, switchgear, transformers, hauling winches and motors. (A.Y. 12094.)*
CAIRO.—January 27th. Ministry of Public Works. Two complete fully automatic refrigerating units, insulating material and special air-tight insulated doors. (A.Y. 12146.)*
February 3rd. Electrically driven reciprocating pump. (G.Y. 13311.)*

Erith.—January 15th. Electricity Department. Laying, jointing and testing of 11½ miles of h.p. and l.p. cables. (December 29th.)
February 5th. Electricity Department. H.p. and l.p. switchgear and other apparatus for sub-station equipment. (See this issue.)

Farnworth.—January 22nd. Electricity Department. L.p. cables. (See this issue.)

Fife.—January 27th. County Council. Electric lighting installation for twenty houses at Crossford. Specifications, &c., from P. Reid, architect, Inverkeithing (deposit £1 1s.); tenders to County Clerk, County Buildings, Cupar.

Halifax.—January 22nd. Corporation. Electrical work at twenty-six houses on Ovenden Hall Estate. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Hull.—January 16th. Electricity Department. Stores for twelve months from April 1st. (January 5th.)

Liverpool.—January 24th. Corporation. Materials for twelve months ending March 31st, 1935, including cables, meters, lamps, a.c. motors and starting gear, cookers, kettles, &c. (January 5th.)

London.—ISLINGTON.—January 17th. Borough Council. Electrical and engineers' stores for one year commencing April 1st, 1934. (December 8th.)
HACKNEY.—January 24th. Electricity Department. Meters and demand indicators. Kiosks, e.h.p. and l.p. switchgear and transformers. (December 29th.) Cables and cords for twelve months, commencing April 1st. (January 5th.)
ST. PANCRAS.—February 8th. Borough Council. Traffic signals. (See this issue.)

Manchester.—January 26th. Electricity Committee. Electric cooking ranges for twelve months. (See this issue.)
January 31st. Economisers, switch units, oil-immersed reactors, and voltage-variation equipment. (See this issue.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. January 30th. 300 Planté positive battery plates. (A.Y. 12104.)* Two hot-cathode type rectifiers. (A.Y. 12106.)* Twenty 180-ohm resistance spools. (A.Y. 12105.)*
January 31st. One stationary battery of twelve unburnt cells. (A.Y. 12107.)*
February 6th. 71,000 dry cells for telephone use. (A.Y. 12101.)*
February 13th. Twenty-four 0-8430-ohm rheostats. (A.Y. 12.103.) Fifty miles of tinned copper v.i.r. wire. (A.Y. 12108.)*
February 19th. 1,000 ebonite or bakelite telephone earpieces. (A.Y. 12133.)*
February 19th. Inset transmitters, bakelite mouthpieces and microtelephone plungers for automatic table telephones. (A.Y. 12131.)*
March 13th. 3,000 four-conductor telephone cords. (A.Y. 12149.)*
March 15th. Twenty-six 2-V 130-Ah cells. (A.Y. 12152.)*
January 31st. Government Stores Control Board. Electric lamps for one year. (A.Y. 12128.)*

Northern Ireland.—BELFAST.—January 18th. County Borough Council. Maintenance of electrical window cleaning installation at the Museum and Art Gallery for twelve months from April 1st. Town Clerk.
Electricity Committee. January 19th. Stores and materials for twelve months from April 1st, including meters, instrument transformers, maximum-demand indicators, time switches, cut-outs, static transformers, transformer kiosks with h.p. and l.p. switchgear, and electric kettles (deposit £2 2s.). Electrical installations in residences under the Corporation assisted-wiring scheme during the twelve months ending January 31st, 1935 (deposit £2 2s.). Town Clerk.
Tramway Committee. January 23rd. Supply of stores for twelve months from April 1st, including electrical accessories, cable, insulation armature coils, field coils and lamps. Town Clerk.

Plymouth. — February 8th. Corporation. Meters, time switches, underground cable, transformers, e.h.p. and l.p. switchgear. (See this issue.)

Runwell (Essex).—February 28th. East Ham and Southend-on-Sea Joint Visiting Committee. Electrical installation at Mental Hospital. (December 22nd.)

South Africa.—PRETORIA.—March 2nd. City Council. Turbo-alternator, condensing plant and auxiliaries, boilers and electrically operated crane. (December 22nd.)
February 2nd. Government Supplies Board. Telephone material comprising terminal window blocks, outdoor distribution boxes, sub-station protectors, standard terminal blocks and condensers. (A.Y. 12161.)*
BULAWAYO.—February 1st. Municipality. One 4,000-kW turbo-alternator, switchgear, and transformers. (A.Y. 12122.)*
GWELO.—February 6th. Municipality. Equipment for extensions to electricity undertaking comprising two 1,000-kW turbo-alternators, pumps, crane, switchgear, transformers, &c. (A.Y. 12124.)*
JOHANNESBURG.—January 20th. City Council. One summation equipment, complete with transmitting meters, printometers, time switches and panel. (A.Y. 12136.)*
CAPETOWN.—January 31st. Electricity Department. 4,000 15-A four-pin plugs and sockets. (A.Y. 12137.)*
4,000 metal-clad house-service switch and fuse boards. (A.Y. 12138.)*
DURBAN.—February 2nd. Corporation. Lead-covered dry-core p.i. cables. (A.Y. 12135.)* Private branch exchange telephone switchboards and spare equipment. (A.Y. 12132.)*

Southend-on-Sea.—February 8th. Electricity Department. General stores for twelve months. (See this issue.)

Swansea.—February 8th. Electricity Department. Sulphur and dust extraction plant, lime plant and ash plant for Tir John power station. (January 5th.)

Tottenham.—January 16th. U.D.C. Renewal of electrical installation in the Town Hall and Central Baths. (December 15th.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aldershot.—Town Council. Accepted. Switchgear (£455).—Switchgear & Cowans, Ltd. Transformers (£467).—General Electric Co., Ltd. Meters.—R. Hornby, Ltd.

Carlisle.—Electricity Committee. Accepted. Two 600-kVA transformers (£522).—Brush Electrical Engineering Co., Ltd.

Cheltenham.—Highways Committee. Accepted. Automatic traffic signals (£388).—Automatic Electric Co., Ltd.

East Ham.—Health Committee. Recommended. Internal telephones at sanatorium (£85).—Automatic Electric Co., Ltd.

Glasgow.—Corporation. Transport Committee. Accepted. Charging set for "Nife" battery.—F. W. Murray. Automatic signalling equipment for subway.—Westinghouse Brake and Saxby Signal Co., Ltd.
Education Committee. Accepted. Electrical work at schools (£79).—Kennedy, Stark & Co.
Housing Committee. Accepted. Electrical installation at housing schemes (£279).—Darroch & Espie.

Ilford.—Electricity Committee. Accepted. Transformers.—English Electric Co., Ltd. (£217).—Fuller Electrical & Manufacturing Co., Ltd. (£213).

India.—BOMBAY.—Municipal Corporation. Accepted. Transformer, motors, &c., for pumping station (Rs. 11,996).—G.M.A. Diesel & Electrical Co.

Kirkcaldy (Fife).—Corporation Harbour Committee. Recommended. Installation of new flasher and fog signal at Harbour (£321).—Chance Bros. & Co., Ltd.

Leeds.—Transport Committee. Accepted. Plant for automatic sub-station on the Middleton tram route (£1,313).—Bruce, Peebles & Co., Ltd.
Electricity Committee. Accepted. Cables (£900).—Edison Swan Cables, Ltd.; (£720).—Macintosh Cable Co., Ltd.; (£238).—Enfield Cable Works, Ltd.; (£587).—Hackbridge Cable Co., Ltd.; (£1,060).—Metropolitan Electric Cable & Construction Co., Ltd.

Liverpool.—Electric Power and Lighting Committee. Recommended. 2,570 yds. of 1 sq. in. 33,000-V. three-core cable and thirteen straight-through joint boxes (£2,689).—W. T. Henley's Telegraph Works Co., Ltd.

Maidenhead.—Town Council. Accepted. 150-kVA transformer (£107) and a 100-kVA transformer (£83).—Hackbridge Electric Construction Co., Ltd.

Maidstone.—Town Council. Accepted. Overhead line at Lunsford Lane (£564).—Johnson & Phillips, Ltd. Switchgear for the Granada Theatre (£144).—General Electric Co., Ltd.

Plymouth.—Electricity Committee. Accepted. Automatic voltage regulator at Prince Rock station (£162).—Metropolitan-Vickers Electrical Co., Ltd.

Portsmouth.—Electricity Committee. Accepted. Two 500-kVA Scott groups (£125 per group) and two 200-kVA outdoor transformers (£102 each).—Hackbridge Electric Construction Co., Ltd. Six 200-kVA indoor transformers (£98 each) and two 750-kVA indoor transformers (£232 each).—British Electric Transformer Co., Ltd. Two 100-kVA outdoor transformers (£65 each).—English Electric Co., Ltd.

Assistance Committee. Accepted. Electric lighting installation at offices (£167).—Quinton & Scammell.

Rotherham.—Electricity Committee. Accepted. Two special transformers.—Electric Construction Co., Ltd.

Sheffield.—Electricity Committee. Accepted. Two 20,000-kVA transformers (£13,917).—English Electric Co., Ltd. Switchgear (£8,083).—British Thomson-Houston Co., Ltd.

Worthing.—Highways Committee. Accepted. Seventeen standards and fittings for parade lighting (£469).—General Electric Co., Ltd.

Forthcoming Events

British Electrical Development Association.—Friday, January 12th. Oxford Galleries, Newcastle-on-Tyne. Annual Carnival. Wednesday, January 17th. Caxton Hall, S.W. 7.30 p.m. "The Art of Public Speaking." Mr. Elliott Stone.

Society of Chemical Industry.—Friday, January 12th. Burlington House, London. 8 p.m. Joint meeting of Engineering and Plastics Groups. "Plastics as Engineering Material." Mr. H. L. Rowell.

Electrical Contractors' Association.—(*Bristol Branch*).—Friday, January 12th. Grand Hotel, Bristol. 6.30 p.m. for 7 p.m. Annual dinner and dance.

Junior Institution of Engineers.—Friday, January 12th. Institution, London, 7.30 p.m. "Road Traffic Signalling Systems." Mr. H. J. N. Riddle.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday, January 13th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Fabricated Construction as Applied to Electrical Mining Gear." Mr. J. A. Dorrat. Saturday, January 20th. New Continental Café, Cardiff. 6.30 p.m. for 7 p.m. Annual dinner. (*West Wales Branch*).—Saturday, January 13th. Y.M.C.A., Swansea. Discussion on "Underground Illuminations." Opened by Mr. S. T. Richards.

Electrical Power Engineers' Association.—(*London Technical Group*).—Monday, January 15th. Australia House, London. "High Pressure Testing of E.H.T. Switchgear, &c."

Association of Supervising Electrical Engineers.—Tuesday, January 16th. Lighting Service Bureau, W.C. 7.15 p.m. "Street Lighting of the Future." Mr. W. J. Jones.

Diesel Engine Users Association.—Wednesday, January 17th. Caxton Hall, London. 3 p.m. Report of the Committee on Heavy-oil Engine Working Costs (1932-33).

Royal Society of Arts.—Wednesday, January 17th. John Street, London. 8 p.m. "Modern Developments in Street Lighting." Mr. J. M. Waldram.

Television Society.—Wednesday, January 17th. University College, W.C. 7 p.m. "The Application of the Cathode Ray Tube to Television." Messrs. G. Parr and T. W. Price.

Institution of Electrical Engineers.—Thursday, January 18th. Institution, London. 6 p.m. "Some Aspects of the Electrical Transmission of Power by means of D.C. at Very High Voltages." Mr. H. Rissik. (*South Midland Centre*).—Monday, January 15th. James Watt Memorial Institute, Birmingham. 7 p.m. "Some Aspects of the Electrical Transmission of Power by Means of Super-Tension D.C." Mr. H. Rissik. (*Tees-side Sub-Centre*).—Monday, January 15th. Cleveland Technical Institute, Middlesbrough. 7 p.m. Address by Mr. F. H. Williams. (*Western Centre*).—Monday, January 15th. Royal Hotel, Cardiff. 6.30 p.m. for 7 p.m. Annual dinner. (*East Midland Sub-Centre*).—Tuesday, January 16th. Welbech Hotel, Nottingham. Joint Meeting with Institute of Fuel. "The Selection of Coals for Steam Raising." Mr. C. A. Seyler. (*London Students' Section*).—January 16th. Victoria Halls, W.C. 7.30 p.m. Joint dance of graduates and students of Institutions of Electrical and Mechanical Engineers and London Students of Civil Engineering. January 17th. 2.30 p.m. Visit to Battersea Power Station. (*North Midland Students' Section*).—Tuesday, January 16th. Hotel Metropole, Leeds. 7.15 p.m. "A.C. Crane Control and Operation." Mr. H. Thompson. Saturday, January 20th. 3.15 p.m. Visit to works of Messrs. J. Lumb & Co., Ltd. (*Sheffield Sub-Centre*).—Wednesday, January 17th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "An Analysis of the Costs of Electricity Supply and Distribution in Great Britain." Mr. J. M. Kennedy and Miss D. M. Noakes. (*Irish Centre*).—Thursday, January 18th. Trinity College, Dublin. 7.45 p.m. "Application of Automatic Voltage and Switch Control to Electrical Distribution systems." Messrs. W. Kidd and J. L. Carr. (*Scottish Students' Section*).—Thursday, January 18th. Royal Technical College, Glasgow. 7.30 p.m. Joint meeting with Institution of Mechanical Engineers Students' Section. "Engineering Developments in Traction Work." Mr. E. R. L. Fitzpayne. (*North-Eastern Students' Section*).—Friday, January 19th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Radio Interference from High Voltage Lines." Mr. J. H. Sumner.

Makers' Names Wanted

CROWN electric lamp.

OMEGA tape.

WINCHES with the following markings: N. Western Cathcart; N.W. Universal; North Western Winch.

MANTHE electric clock.

SUPREME hair dryer.

Notes

I.E.E. Dinner

The annual dinner and reunion of the Institution of Electrical Engineers will be held at Grosvenor House, Park Lane, W., on February 8th, under the presidency of Mr. P. V. Hunter. In order to ensure greater comfort, arrangements have been made for the dinner to be held in the Ice Rink on this occasion instead of in the ballroom.

Electrical Engineers' Dance

Readers are reminded that the Electrical Engineers' Dance will be held on January 26th at the Grand Hotel, Harrogate. Tickets, inclusive of dinner, but not wines, one guinea each (student members, 15s. each), can be obtained from the hon. secretary, Mr. W. R. T. Skinner, 36, Park Place, Leeds. Special arrangements have been made for guests desiring to stay the night at the Grand Hotel. As a result of the dance it is hoped to hand a donation to the I.E.E. Benevolent Fund.

Fatality

In the Westminster Coroner's Court last week Mr. Ingleby Oddie held an inquest on John Taylor (54), an electrician of Kilburn. He was employed at the premises of Messrs. Harvey Nichols & Co., Ltd., Knightsbridge, W., where, on December 29th, he received a fatal electric shock.

His mate, Wallace Gillett, stated that they were in the second basement, where there were motors. Taylor was jointing a "live" cable to a "dead" one. Being on wooden steps he was insulated against shocks. He had insulated one of three cables with a piece of rag. There would be 400 V across the two bare portions of cable. Apart from the possibility of a shock from the bare cables there was a metal fitting which would make an earth. Dr. Robinson (St. George's Hospital) said that there was the mark of a burn on the outer edge of Taylor's right hand. Death was due to electric shock.

George Newell, foreman electrical engineer, said that Taylor, who was working under his supervision, had instructions to move one starter and put it on the proper panel. He could have switched off if he had wished. He was preparing to put the ends on after stripping the cables. It was possible that he slipped and in trying to save himself touched one of the steam pipe hangers and so made an earth, or he may have got across two phases by mistake. Mr. Oddie recorded a verdict of "Accidental death."

Electric Steel Furnaces in France

In a recent issue of the *Journal du Four Electrique et des Industries Electro-chimiques*, particulars are given of the various works in Eastern France producing steel by means of electric furnaces. The Société Lorraine Minière et Métallurgique, Thionville, has two arc-type furnaces (20 and 10 tons) and a 14-cwt. high-frequency induction furnace. The arc furnaces are of the Secomet type provided with Acheson electrodes. The power is received at 5,000 V, and is stepped down to 85, 110, 147, and 190 V by means of two transformers (5,000 and 2,750 kVA). The Société des Hauts Fourneaux has a "Demag" 15-ton electric furnace at its works at La Chiers, while a concern affiliated with the Renault Motor Co. has a 25-ton "Demag" furnace at Hagondage.

A Wharf Travelling Skip

A ten-cu. yd. electric travelling skip has recently been supplied to a London borough council's Thames-side wharf, A.C.E. Machinery, Ltd., Porden Road, Brixton, London, S.W.2, being the sole designers and contractors. The equipment enables garbage carts, lorries, and freighters to discharge their loads into barges or lighters without interruption at any tide stage and at very high tides. The skip at rest with its top edge about 9 in. below the yard level permits the vehicle contents to be tipped directly into it, after which the vehicles are moved out and the hoist is operated by automatic push-button control. Moving the switch to the "start" position sets everything ready for the normal cycle of operations.

The skip slowly travels up to the top or tipping position, enabling it to discharge its load through an adjustable chute direct into the barge. After pausing in the top or tipping position for a few seconds it automatically reverses and returns to the bottom or loading position, where it stops ready to receive the next load. At the end of the day the switch can be thrown over to the "stop" position, making the whole of the electrical plant inoperative. This switch can also be used as an emergency stop. When the skip arrives at the top or tipping position it touches a limit switch which operates the relay, which in turn stops the motor. The switch arm or plunger now slowly falls back to the starting position under air dashpot control.

On arriving at the bottom of its travel it trips another contact which throws the motor into reverse and starts it up again, and so returns the skip to the bottom or loading position. On arriving here it touches another limit switch, which automatically stops the motor, and from this position it can be restarted only by pressure on the operating button.

Should either of these limit switches fail in any respect, there are other emergency limits set a couple of inches farther on, which are positive in action by virtue of the fact that they are in series with the power supply, and actually open the main circuit. This prevents any possibility of overwinding.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. Allen Johnson, who has been nominated president of the American Institute of Electrical Engineers, is a leading power generation and transmission expert. He has been closely connected during the greater part of his career with electrical engineering developments at the Niagara Falls.

Dr. A. E. Kennelly has been awarded the Edison Medal for 1933 by the American Institute of Electrical Engineers. He was born in Bombay, and educated at the University College School, London, in Scotland, and on the Continent. He went to the United States in 1887, and was Edison's principal assistant until 1894, when, according to the *Electrical World*, the partnership of Houston and Kennelly began. He was appointed professor of electrical engineering at Harvard University in 1902, and continued in that position until 1930, when he retired from active service.

We now have pleasure in reproducing the portrait of **Mr. G. L. Kirkpatrick,** who has been appointed managing director of Messrs. Bruce Peebles & Co., Ltd., not *general* managing director, as reported in our last issue.

Mr. G. L. Kirkpatrick

Mr. W. H. Tyce has been appointed by Messrs. Greenwood & Batley, Ltd., as their technical representative in South Wales. Mr. Tyce's address is 1, Kymin Terrace, Penarth, Glam.

Mr. A. Holmes has been appointed showroom and sales manager at the Warrington Electricity Department's showroom.

Lord Weir, whose inclusion in the New Year Honours List was mentioned in our last issue, is chairman of Messrs. G. & J. Weir, Ltd., and not managing director.

At the ordinary meeting of the Institution of Electrical Engineers, to be held January 18th, **Viscount Falmouth** will present to the Institution a copy of Sir William Orpen's painting of the late Sir Charles Parsons.

Sir Douglas Newton, M.P., who was created a peer in the New Year Honours, has chosen as his title Lord Eltisley of Croxton. Sir Douglas is Lord of the Manor of both Eltisley and Croxton, and the livings are in his gift.

Mr. R. Birt, chief assistant electrical engineer to the Ealing Borough Council was, on Tuesday last, appointed to succeed Mr. J. D. Knight as borough electrical engineer. The commencing salary is £900, rising to £1,250.

Mr. K. Graham has been presented with a clock on his retirement after thirty-three years' service as sub-station assistant in the Huddersfield Corporation Electricity Department.

Mr. F. W. Hewitt, M.Sc., and **Mr. A. E. Rayner** have been appointed by the Council of the Institution of Electrical Engineers as assistant secretaries of the Institution as a mark

Mr. A. E. Rayner and Mr. F. W. Hewitt, who have been appointed assistant secretaries of the I.E.E.

of recognition of their long and good service. These gentlemen are well known to hundreds of members, Mr. Hewitt having been twenty-one years in the service of the Institution and Mr. Rayner thirty-three years.

Mr. A. Foster, of Cleckheaton, has been appointed mains engineer by the Eastbourne Corporation Electricity Committee.

London Passenger Transport Board.—The following appointments have been made in the department of the Chief Electrical Engineer of the London Passenger Transport Board:—Chief electrical engineer, Mr. J. H. Millen, A.M.I.E.E.; electrical engineer (Lots Road), Mr. A. L. Lunn, M.I.E.E., M.I.Mech.E.; constructional engineer (Lots Road), Mr. E. H. Cockshott, A.M.I.C.E., M.I.E.E.; electrical engineer (Neasden), Mr. P. R. Boulton, M.I.E.E.; electrical engineer (Greenwich), Mr. J. H. Parker, M.I.E.E.; constructional engineer (Greenwich), Mr. G. D. Meynell, M.Inst.C.E., A.M.I.E.E.

Mr. J. H. Millen

Mr. F. V. Jordan, A.M.I.E.E., who for the last fifteen months has been resident engineer in charge of the contract of Callender's Cable & Construction Co., Ltd., for the Mosul Electric & Water Board, has been appointed city electrical and water engineer to the Mosul Board in succession to Mr. C. F. Pallot, who has resigned. His commencing salary is £1,080 per annum.

Obituary

Mr. A. P. Crouch.—The death of Mr. Archer Philip Crouch, a former secretary of the India Rubber, Gutta Percha & Telegraph Works Co., Ltd., will be regretted by the circle, gradually becoming smaller and smaller, of those who went on submarine-cable-laying expeditions in different parts of the world, especially during last century, in the service of the Silvertown Company. Mr. Crouch was seventy-five years of age. He was a member of the staff of the late Sir Charles Tilston Bright.

M. Scherrer.—Following the destruction of the Lac Noir hydro-electric station (see page 51) the engineer responsible for its design, Monsieur Scherrer, is reported to have committed suicide.

Mr. H. W. Ridley.—We regret to announce the death of Mr. Herbert Walter Ridley, M.I.E.E., on December 27th, at the age of sixty-five. Mr. Ridley had been in the service of the London County Council from 1891 until his retirement in July last year. The Electric Lighting Acts for districts in the London area impose certain duties and obligations on the L.C.C. Mr. Ridley's work was almost wholly in respect of these obligations, and he was well known to all engineers associated with electricity supply in London. His knowledge of the legal aspect and of the growth and development of electricity supply in London was extraordinarily wide. He was for many years responsible for the Council's laboratory for the testing of "disputed" meters and also for the settlement of disputes between consumers and undertakers arising out of changes in systems of supply. In these latter, his charm of manner and his ready wit stood him in good stead and paved the way to the friendly settlement of many difficult matters. Mr. Ridley was educated at Taunton School. He was a well-known figure in the Old Boys' Association, which he helped to found forty years ago, and he was president of the Association at the time of his death.

The late Mr. H. W. Ridley

Mr. A. S. Rickards.—The death has occurred, at the age of fifty-two years, of Mr. Arthur S. Rickards, electrical engineer in the Industrial Sales Department of the British Thomson-Houston Co., Ltd., at Rugby. He had been with the company for about twenty years.

Wills.—Lady Parsons, widow of Sir Charles Parsons, left estate of the gross value of £108,160, with net personalty £94,994.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

C. & R. Research, Ltd.—Private company. Registered January 3rd. Capital, £510 in 490 10 per cent. preference shares of £1 and 400 ordinary shares of 1s. each. Objects: To test, manufacture, turn to account and deal in inventions relating to radio-telephony, radio-telegraphy and television, to carry on the business of radio, electrical, cinematograph and mechanical lamp makers and dealers, &c. The directors are: B. A. Collins, Oakley House, Aldeburgh, Suffolk; and F. O. Read, 26, Flanders Road, Chiswick, W.4. Registered office: 117, Church Street, Kensington, W.8.

Sign Transformer Co., Ltd.—Private company. Registered January 3rd. Capital, £100 in £1 shares. Objects: To acquire the business of an electrical apparatus manufacturer and dealer carried on by H. R. Watson at 11a, St. George's Road, Wimbledon, S.W.19, and to carry on the business of manufacturers of and dealers in transformers, dynamos, motors, signs and advertisements, &c. The directors are: H. R. Watson and Mrs. E. L. B. Watson, both of 33, Effra Road, Wimbledon, S.W.19.

Gardners Radio, Ltd.—Private company. Registered January 3rd. Capital, £2,000 in £1 shares. Objects: To acquire the business of a wireless telegraph engineer and dealer in apparatus and accessories appertaining thereto carried on by A. Gardner at 8, Carbery Row, West Southbourne, Bournemouth, as "Gardners Radio." The permanent directors are: A. Gardner, H. G. Gardner and C. J. Gardner, all of 21, Saxonbury Road, Southbourne, Hants. Solicitor: George T. Richards, 67, Southbourne Grove, West Southbourne, Bournemouth.

Hornes Radio, Ltd.—Private company. Registered January 1st. Capital, £500 in £1 shares. Objects: To carry on the business of radio, electrical and photographic contractors, manufacturers, engineers and retailers, &c. The first directors are: W. J. Haden, 20, Terrace Road, Mount Pleasant, Swansea; and T. Matthews, 2, Nantydd Terrace, Llanelly. Registered office: 53, Stepney Street, Llanelly.

Ernest Cooper (Electricians), Ltd.—Private company. Registered January 1st. Capital, £250 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor and wireless retailer carried on by E. Cooper at 101, Dale End, Birmingham. The first directors are: E. Cooper and Julia M. Cooper, both of 133, Welford Road, Shirley, near Birmingham. Registered office: 105, Colmore Row, Birmingham.

British Dry Cell Co., Ltd.—Private company. Registered January 2nd. Capital, £2,000 in £1 shares (1,400 "A," 500 "B," and 100 "C"). Objects: To acquire the business of the British Dry Cell Manufacturing Co., Ltd., and to carry on the business of manufacturers, importers and exporters of and dealers in dry cells, batteries, wireless, electrical and musical goods and accessories, &c. The permanent directors are: C. W. Stokes, White House, Caledon Road, Beaconsfield: D. Grabow, 45, Litchfield Way, N.W.11; and E. S. Harley, address not stated. Registered office: 69a, Downs Park Road, Hackney, E.

King's Norton Electrical Co., Ltd.—Private company. Registered December 29th. Capital, £100 in 1s. shares. Objects: To carry on the business of electricians, electrical and wireless engineers and repairers, &c. The first directors are: B. H. Cullum, 118, Scribers Lane, Hall Green, Birmingham; and J. P. Robertson, 79, Inverness Road, Northfield, Birmingham. Registered office: 2, The Green, King's Norton, Birmingham.

Radiamp Co., Ltd.—Private company. Registered January 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in radio, electrical and television apparatus, machines, components and accessories, general engineers, &c. The permanent directors are: S. H. Fowler, 38, Chester Road, Tottenham, Middlesex; K. J. Fowler, 38, Monastery Gardens, Enfield; and A. H. Fowler, 1, Farningham Road, Tottenham.

Clyde Battery Co., Ltd.—Private company. Registered in Edinburgh January 3rd. Capital: £10,000 in 7,500 preference shares of £1 and 25,000 ordinary shares of 2s. each. Objects: To carry on the business of mechanical, electrical and motor engineers, manufacturers and repairers of and dealers in primary batteries and other electrical and radio goods of all kinds, &c. The directors are: J. C. Pollock, 24, Mansion House Road, Langside, Glasgow, and F. G. Seligmann, 20, Roxburgh Street, Glasgow, W.2. Registered office: 108, Douglas Street, Glasgow.

Super Radio (All Saints), Ltd.—Private company. Registered December 27th. Capital: £100 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in all kinds of electrical and other instruments and appliances in connection with wireless telegraphy, &c. The permanent directors are: H. I. Freeman and Mrs. F. R. Freeman, both of 24, Ullet Road, Liverpool. Registered office: 74, Oxford Road, All Saints, Manchester.

Decee-Acee, Ltd.—Private company. Registered December 22nd. Capital, £250 in £1 shares. Objects: To acquire the business of a wireless dealer, heretofore carried on by A. Wade at 69, Manchester Road, Burnley. The directors are: A. Wade and Mrs. Laura Wade, both of 9, Carlton Road, Burnley. Registered office: 69, Manchester Road, Burnley.

British Ferrocart Co., Ltd.—Private company. Registered December 27th. Capital: £100 in £1 shares. Objects: To carry on the business of makers of and dealers in apparatus for and accessories to wireless receiving sets and parts thereof, and all articles used in wireless transmission, electricians, electrical engineers, &c. The subscribers are: A. L. Collins and M. H. Heilbert, both of Kennan's House, Crown Court, Cheapside, E.C.2. Solicitors: Wild, Collins & Crosse, Kennan's House, Crown Court, Cheapside, E.C.2.

Pikards (Wholesalers), Ltd.—Private company. Registered December 21st. Capital: £2,000 in £1 shares. Objects: To adopt an agreement with H. Pickup and D. E. Hardie, and to carry on the business of manufacturers and repairers of and wholesale dealers in dynamos, motors, armatures, magnetos, batteries, &c. The permanent directors are: H. Pickup (chairman), Weycroft Lodge, Arterberry Road, Wimbledon, and D. E. Hardie, 12, Decoy Avenue, N.W.11.

Meca-Lectic Engineering Co. (Glasgow), Ltd.—Private company. Registered in Edinburgh December 18th. Capital: £2,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, tool makers, automatic machine manufacturers, &c. The directors are: P. Shiels, 5, Winston Gardens, Knock, Co. Down, J. A. Walker, 22, Exeter Drive, Glasgow, and A. M. Frame, 13, Lawrence Street, Glasgow. Registered office: 141, Bath Street, Glasgow.

Orpheus Radio, Ltd.—Private company. Registered in Edinburgh December 18th. Capital: £1,000 in £1 shares. Objects: To carry on the business of dealers in and manufacturers of wireless apparatus, musical instruments, &c. The directors are: A. Mackenzie, both of "Avondale," 76, Causewayhead Road, Stirling. Registered office: 166, Buchanan Street, Glasgow, C.1.

Leitner Electric Brake, Ltd.—Private company. Registered December 22nd. Capital: £7,500 in 6,000 7½ per cent. preference shares of £1 and 30,000 ordinary shares of 1s. each. Objects: To acquire the letters patent granted or which may in future be granted to Henry Leitner for inventions relating to improvements in homopolar dynamos more particularly for use in electric brakes and improvements in the regulation of electric brakes, and the machinery and apparatus therefor, and to carry on the business of electrical and chemical engineers and contractors, mechanical engineers, &c. The directors are: H. Leitner, 408, Abbey House, Westminster, S.W.1, and A. H. Pickard, address not stated.

Anestystun, Ltd.—Private company. Registered January 6th. Capital: £500 in £1 shares. Objects: To manufacture and deal in electrical apparatus for the electrical stunning and slaughtering of animals, &c. The directors are: J. S. Ramsbottom, Sunny Mount, Riddlesden, Keighley, and H. Green, Beech Mount, Cononley, Keighley. Registered office: Bow Street, Keighley.

London School of Electrical Domestic Science, Ltd.—Private company. Registered January 6th. Capital: £100 in £1 shares. Objects: To carry on in London or elsewhere schools of electrical and general domestic science, &c. The first directors are: Helen M. M. Minoprio, St. Clements House, Bolsover Street, W.1, and Gwendolin C. Major, 234, Temple Chambers, E.C.4. Registered office: Imperial Court, Basil Street, Knightsbridge, S.W.

Willesden Radio & Electrical Co., Ltd.—Private company. Registered January 4th. Capital: £1,000 in £1 shares (500 6 per cent. cum. preference). Objects: To carry on the business of electricians, mechanical, electrical and gas engineers, manufacturers of and dealers in electrical and gas fittings, batteries, accumulators, wireless apparatus and accessories, &c. The directors are: C. J. Hamilton Crowe, 84, Cobbold Road, Willesden, and R. H. G. Heselden, 9, Murray Street, New North Road, Islington.

Returns of Electrical Companies

General Electric Co., Ltd.—Capital: £7,600,000 in 1,800,000 6½ per cent. "A" preference, 1,800,000 7½ per cent. "B" preference, 2,400,000 ordinary, and 1,600,000 British ordinary shares, all of £1 each. Return dated July 12th, 1933. All the "A" and "B" preference and 2,253,645 of the ordinary shares taken up. £4,831,819 paid on 1,575,540 "A" preference, 1,777,109 "B" preference, and 1,479,170 ordinary shares, £1,021,826 considered as paid on 244,460 "A" preference, 22,891 "B" preference, and 774,475 ordinary shares. Mortgages and charges at date of return: £3,500,000 4½ per cent. 1st mortgage debenture stock and £939,700 5 per cent. mortgage debenture stock. (The 5 per cent. mortgage debenture stock was fully satisfied on September 30th, 1933.)

John Bennie, Ltd.—C. R. Dormer, 14, George Street, Mansion House, E.C.2, was appointed receiver and manager by Order of Court dated December 20th, 1933.

Electric Driers, Ltd.—Capital, £2,000 in £1 shares. Return dated October 13th, 1933. All shares taken up. £1,950 paid. £50 considered as paid. Mortgages and charges, nil.

Frinton-on-Sea & District Electric Light & Power Co., Ltd.—Capital, £50,000 in 7,300 preference and 42,700 ordinary shares of £1. Return dated June 22nd, 1933. All shares taken up. £50,000 paid. Mortgages and charges, nil.

Hooper's Telegraph & India Rubber Works, Ltd.—Capital, £50,000 in 1,000 preference and 4,000 ordinary shares of £10 each. Return dated July 24th, 1933. All shares taken up. £40,000 paid on the ordinary shares. £10,000 considered as paid on the preference shares. Mortgages and charges, nil.

Electric & General Investment Co., Ltd.—Capital, £201,500 in 19,900 preference and 20,000 ordinary shares of £5 and 40,000 deferred shares of 1s. Return dated July 28th, 1933. 19,900 preference, 20,000 ordinary, and 40,000 deferred shares taken up. £121,500 paid (being £5 per share on the preference, £1 per share on the ordinary and 1s. per share on the deferred shares). Mortgages and charges, nil.

Anglo-Argentine Tramways Co., Ltd.—Capital, £11,000,000 in 800,000 1st preference shares of £5, 710,000 2nd preference shares of £5, and 862,500 ordinary shares of £4. Return dated July 25th, 1933. 640,000 1st preference, 610,000 2nd preference, and 675,000 ordinary shares taken up. £350,000 paid on 20,000 1st

preference and 150,000 ordinary shares. £8,100,000 considered as paid on the remainder. Mortgages and charges, £70,660, annuity: £4,465,674 per cent. debenture stock, £1,733,380 4½ per cent. debenture stock, and £6,000,000 5 per cent. debenture stock.

British Dardelet Threadlock, Ltd.—Satisfaction in full on June 28th, 1933, of charge dated August 22nd, 1932, and deed of confirmation dated September 27th, 1932, and registered September 7th and 30th, 1932, respectively. (Notice filed December 22nd, 1933.)

Edison Bell (International), Ltd.—Particulars filed of debentures not exceeding £11,250 authorised October 9th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,690.

Adelaide Electric Supply Co., Ltd.—Issues on various dates from June 11th, 1918, to March 26th, 1930, of £1,650,000 debentures, part of a series already registered. (Particulars of issues filed December 27th, 1933.)

Star Electrical Co., Ltd.—Particulars filed of debentures, not exceeding £1,250, authorised December 14th, 1933, charged on the company's property, present and future, including any uncalled capital, the amount of the present issue being £1,250.

Albion Shades, Ltd.—Edward B. Costello, Exchange House, Old Change, E.C.4, ceased to act as receiver on December 30th, 1933.

Electracts, Ltd.—Wm. B. Pearson, Polebrook House, Golden Square, W.1, ceased to act as receiver and/or manager on September 4th, 1933. (Notice filed December 29th, 1933.)

Normand Electrical Co., Ltd.—Capital: £7,000 in £1 shares. Return dated October 12th, 1933. 6,224 shares taken up. £6,224 paid. Mortgages and charges: Nil.

Kalgoorlie Electric Tramways, Ltd.—Capital: £250,000 in £1 shares. Return dated July 12th, 1933. All shares taken up. £250,000 paid. Mortgages and charges: £78,750 "B" debenture stock.

Durham & District Electric Traction Co., Ltd.—Capital: £30,000 in £1 shares. Return dated September 7th, 1933. Seven ordinary shares taken up. £7 paid. Mortgages and charges: Nil.

Chatterton & Keen, Ltd.—Issue on December 1st, 1933, of £500 debentures, part of a series already registered.

P. Ormiston & Sons, Ltd.—Particulars filed of £3,000 debentures authorised December 13th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Brook Radio Co., Ltd.—C. A. Sandon, 1a, Sloane Court, S.W.3, ceased to act as receiver and/or manager on December 8th, 1933.

Collings & Ayres, Ltd.—Mortgage dated December 1st, 1933, to secure £1,500, charged on "Ivy Villa," 23, Tavistock Street, Bedford. Holder: Mrs. A. E. Norman, 39, The Embankment, Bedford.

Oxford Radio Supplies, Ltd.—Capital: £1,500 in £1 shares. Return dated August 15th, 1933. 1,400 shares taken up. £1,400 paid. Mortgages and charges nil.

Radio Centre, Ltd.—The nominal capital has been increased by the addition of £7,400 beyond the registered capital of £100. The additional capital is divided into 28,000 ordinary shares of 1s. and 6,000 7 per cent. cumulative preference shares of £1.

Johnson & Turner, Ltd.—Capital, £2,000 in £1 shares. Return dated July 10th, 1933. 1,000 shares taken up. £700 paid. £300 considered as paid. Mortgages and charges, nil.

Lincoln Radio Relay Service, Ltd.—Issue on November 21st, 1933, of £500 debentures, part of a series already registered.

Collins, Brown & Co., Ltd.—Particulars filed of debentures not exceeding £500 authorised December 8th, 1933, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £150.

Viozone, Ltd.—A. J. Foster, 37, Walbrook, E.C., ceased to act as receiver and/or manager on December 4th, 1933.

Ellis & Mort, Ltd.—Capital: £20,000 in £1 shares. Return dated September 12th, 1933. 15,000 shares taken up. £10,120 paid, £4,880 considered as paid. Mortages and charges: Nil.

Wilkinson, Bentley & Co., Ltd.—Capital: £3,000 in £1 shares. Return dated November 3rd, 1933. 1,850 shares taken up. £1,850 paid. Mortgages and charges: Nil.

Moreland Electric Welding Co., Ltd.—Capital: £4,000 in £1 shares. Return dated October 26th, 1933. 2,302 shares taken up. £2,202 paid, £100 calls unpaid. Mortgages and charges: Nil.

New Process Welders, Ltd.—The nominal capital has been increased by the addition of £6,030 beyond the registered capital of £2,000. The additional capital is divided into 6,000 6 per cent. cumulative preference shares of £1 and 600 ordinary "B" shares of 1s.

C. E. Greenwood, Ltd.—Agreement to issue debentures dated December 4th, 1933, to secure £100 and all further sums as may be advanced from time to time not exceeding £1,500. Property charged: The company's assets, present and future. Holder: G. A. Martin, 77, South Street, Dorking.

Tyrela Electric, Ltd.—Capital, £5,000 in £1 shares. Return dated September 1st, 1933. 352 shares taken up. £352 paid. Mortgages and charges, nil.

Eco Power, Ltd.—Capital, £1,000 in £1 shares. Return dated October 25th, 1933. All shares taken up. £1,000 paid. Mortgages and charges, nil.

D. R. & L. R. Williams (Electrical Contractors), Ltd.—L. S. Findlay, 35, Windsor Place, Cardiff, ceased to act as receiver and manager on January 1st, 1934.

Simpsons Electricals, Ltd.—A. Hastings, Sheperdene, Kenver Avenue, N.12, was appointed receiver and manager on December 23rd, 1933, under powers contained in first and second debentures dated September 20th, 1932, and March, 1933.

City Notes

The Ceara Tramway, Light & Power Co., Ltd., held its annual meeting on December 29th, when Mr. E. H. R. Trenow (chairman), who presided, said that the general situation of the traction section of their business still presented a difficult problem. Maintenance expenses continued to be heavy and some new cars would have to be provided soon. Furthermore, with the exchange rates such as had obtained over the past few years the rates of fares charged were not economic. The problem of bringing up fares to an economic level presented grave difficulties. Despite the severe commercial depression the lighting and power section had suffered no appreciable fall in gross receipts. Their relations with the authorities were still friendly, but they had before them a demand from the Municipality to submit a drastic revision of their contract of concession. The board had sent the authorities a reasoned statement of the company's case, requesting that the whole position of the public services of the city should be exhaustively examined, with the object of working out a scheme in which the economic possibilities and consequences of such a service should be kept in view. Out of this controversy, and also having regard to the necessities of the traction situation, there was likely to arise a demand for new capital expenditure. This was a matter which affected the debenture stockholders, and the directors were closely in touch with the representative committee of the stockholders which was appointed last year.

Ruths International Accumulators, Ltd.—The *Financial Times* reports that the directors of this company have made an arrangement with British Arca Regulators with regard both to technical co-operation and to the development of sales in Great Britain. British Arca Regulators, an associated company of Belliss & Morcom, is experienced as valve makers in steam engineering. The new company, which will be known as Ruths-Arca Accumulators, will be under the chairmanship of Colonel R. K. Morcom.

The Adelaide Electric Supply Co., Ltd., reports a net profit for the year ended August 31st last of £346,191, as compared with £342,111 for 1931-32. General reserve receives £89,217, and £40,000 is placed to suspense account. The ordinary dividend is maintained at 8½ per cent. and £33,126 is carried forward. The electrical energy sold during the year totalled 64,510,921 kWh, an increase of 14.45 per cent.

Edmundson's Electricity Corporation, Ltd., reports that during December the electrical energy generated and purchased by its undertakings totalled 51,299,000 kWh, as compared with 42,160,000 kWh in the corresponding month of 1932, an increase of 22 per cent. The total for 1933 was 479,130,000 kWh, against 398,473,000 kWh for 1932, an increase of 20 per cent.

The Westinghouse Brake & Saxby Signal Co., Ltd., announces that the accounts for the year to September 30th last, to be issued to-day (Friday) will show a loss of £25,508, after providing for depreciation, interest, working expenses and exchange losses. The profit for 1931-32 was £65,127, when a dividend of 3½ per cent. was paid. The carry forward is reduced from £27,832 to £2,234.

The Traction & General Investment Trust, Ltd., has declared a final ordinary dividend of 6 per cent., making 10 per cent. for the year, against 13 per cent. for 1932.

Stocks and Shares

TUESDAY EVENING.

NEW Year markets in the Stock Exchange have opened optimistically. The turn of the year brought in a great deal of money that had previously been kept back for the purposes of window-dressing at the banks; purchases of gilt-edged stocks have been on a substantial scale. No qualms appear to be entertained on the score of capital, at present invested in the best-class securities, being required for trade purposes. There is, indeed, evidence of abundance of cash being available and ready to take advantage of any industrial openings that occur. Gilt-edged stocks, accordingly, in a good many cases have further improved during the past few business days. Dealers in Stock Exchange markets issue lists periodically, showing the stocks which they, the dealers, have on offer. These lists nowadays contain a good many more blanks in the columns which show stocks on offer than they do amounts which the dealers are able to offer prospective purchasers.

Investment is beginning to wonder whether 4 per cent. will be obtainable for much longer upon even ordinary shares of the best class. Attention may once more be directed to the fact that the ordinary shares of the London electricity supply companies now stand on practically the same level of 34s. 6d., offering a return at that price of £4 1s. 2d. per cent., without making allowance for the accrued dividends payable in the spring.

The stocks of the public boards, Central Electricity, London and Home Counties, and others, show little change on the week. There has been a certain amount of selling of London Passenger Transport "C" stock, apparently by holders who see greater possibilities of energetic movements in prices elsewhere than in this particular stock. To the investor, however, the movements are worth watching, because, if the stock goes to anything like 80, it will make a very useful investment of the long-shot order.

Home Electricity Supply

Metropolitan Electric ordinary shares have risen to 57s., and the new, which came out, it will be remembered, at 40s., are now 16s. premium. The rest of the London group shows no

alteration. In the Provincial shares Bournemouth & Poole are better at 78s. 9d. West Gloucester ordinary fell 1½ to 66. North Eastern ordinary shed 6d. of their last week's substantial rise, and are now 37s. Electrical Distribution of Yorkshire shares hardened to 48s. 3d. Clyde Valley are rather easier at 42s. Richmonds at 58s. are 6d. down. There is a considerable business doing in the shares of the Provincial companies. Many brokers are recommending these issues as an excellent New Year's choice, from the point of view of profit possibilities—not so much from the dividend standpoint, as from that of new issues that are likely to be made during the present year.

Amongst the Indian shares, Calcutta Electric Supply ordinary are better at 54s. 6d. In the miscellaneous group, Atlas ordinary are 1s. higher at 8s. 9d. British Power & Light keep steady at £1.

A noticeable improvement has occurred in the prices of shares in industrial companies connected with Canada. Shawinigan Water shares have risen to 19, Power Corporation of Canada to 9. Most of the other Canadian utility stocks are better. In the South American group Brazilian Tractions strengthened to 11⅜.

Cables and Wireless

Movements of prices in the market for telegraphs and telephones are confined to a rise of £1 in Great Northern Telegraph to 33¼, and to a fall of 2 points in American Telephone and Telegraphs to 107½. The market for these descriptions is quiet and somewhat neglected. Anglo-Portuguese Telephone new shares hold their price at 2s. 9d. premium. Ericsson Telephone ordinary shares, which rose ⅞ last week, are a florin higher at 65s. The 7 per cent. preference are better at 28s. 9d. Enfield Rolling Mills at 32s. 9d. have gained 1s. 3d. Telegraph Condenser ordinary and preference have improved to 23s. 6d.

No little stir has been aroused in Stock Exchange circles by the advance in the rates for cable messages. Shipping, insurance and mercantile interests are concerned, and have offered to co-operate in a protest against, more particularly, the North American charges. It is nothing uncommon for a Stock Exchange firm, doing arbitrage business with New York and Montreal, to send 100 messages a day, many of these being prices of shares, offers or bids, which fail to produce business. Comparing the old rates with the new, a Stock Exchange firm worked out a calculation showing that, with three-word messages, a daily quota of 100 will cost £5,070 per annum more than the old scale entailed. At a private meeting held last week in the Stock Exchange, a committee was appointed to go into the matter with the companies that handle the transatlantic cables, and to represent the heavy burden that the increase of charges lays upon the interchange of business between this country and North America. The committee held a preliminary meeting on Monday last.

Manufacturing and Equipment

The pressure to buy industrials has extended to a number of the shares in the group of electrical manufacturing and equipment companies. British Aluminium ordinary have risen 5s. 6d. to 33s. 6d., there being talk of a possible increase in the dividend. Associated Electrical Industries ordinary at 19s. 6d. are 1s. 9d. to the good. Electric & Musical Industries shot up to 18s. 6d., on demand which started from America. Crompton Parkinsons are unchanged at 22s. 6d. The company notifies that letters of rights have been issued, entitling holders of ordinary and "A" ordinary shares to allotment of new shares. It will be remembered that the company capitalised £9,988 at the end of last November, and decided to issue this as a share bonus in the proportion of one new share for 20 old. Siemens ordinary spurted to 22s. Even Brush ordinary has hardened, the price at 42½ showing a gain of 2½ points. A somewhat mysterious tip went round to buy English Electric shares, and on the strength of the subsequent inquiry the ordinary advanced to 8s. 9d., the preference to 12s. 6d. Most of the iron and steel shares further advanced. A rise of 1s. 9d. took Babcock & Wilcox to 43s. 9d., Vickers to 9s. 6d. The rubber market awaits news as to the negotiations in regard to restriction, and, pending definite information, business in the shares has dwindled to something like a minimum.

Mexican Matters

It can hardly have escaped the notice of attentive students of our price-tables that Mexico Tramways bonds have been offering, for some time past, what seemed a fantastic yield upon money invested in them. For some time past, the interest has been regularly met. The price of the bonds has shown, however, the grave doubt entertained as to the maintenance of the payments. The Mexico Tramways now announces that while the present month's coupon on the bonds of the Mexico Electric Tramways 5 per cent. first charge debentures will be paid, this must be on the understanding that the Mexico Tramways Company will be unable to provide funds for such payment in future. Should any satisfactory scheme be evolved, no doubt the guarantee will continue to be implemented. The Mexico Electric Tramways bonds seldom come to market. Mexico Tramways 5 per cents. are unchanged at 22½.

One picturesque rumour now current is to the effect that a French financial syndicate has made an offer to Mexico proposing that the syndicate shall take over the Mexican debt in exchange for certain concessions.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Approx. Dividend. 1931.	1932.	Price, Jan. 9.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	78/9	+6d.	3 16 3
Brompton Ordinary	1	8½	7	34/–	—	4 2 4
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	8¾	7	34/6	—	4 1 2
City of London	1	10	10	35/–	—	4 0 0
Clyde Valley	1	7	7	42/–	–6d.	3 6 8
County of London	1	10½	10½	57/6	—	3 13 0
Edmundson's 7% Pref.	1	7	7	34/–xd	+6d.	4 2 4
Elec. Dis. Yorkshire	1	9	9	48/3	+9d.	3 14 9
Elec. Supply Corporation	1	11	11	80/–	—	2 15 0
Kensington Ordinary	1	8	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7	36/3	—	3 17 2
London Electric	1	9	7	34/6	—	4 1 2
Metropolitan	1	10	10	57/–	+9d.	3 10 5
Midland Counties	1	7	7	40/–	—	3 10 0
Mid. Elec. Power	1	8	8	45/–	—	3 11 1
North Eastern Electric Ordinary	1	6	6	37/–	–6d.	3 4 10
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	55/–	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13½xd	+½	4 8 11
North Met. Elec. 6% Pref.	1	6	6	30/–	—	4 0 0
St. James' and Pall Mall	1	8	7	34/6	—	4 1 2
Scottish Power	1	8	8	2½	—	3 15 4
South London	1	8½	7	34/6	—	4 1 2
Westminster Ordinary	1	8½	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	—	8 0 0
Yorkshire Elec.	1	8	8	47/6	—	3 7 3

Public Boards.

Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	114	—	4 7 6
Do. 1951–73	,,	4½	4½	106	—	4 5 0
Do. 1963–93	,,	—	3½	93	—	3 15 3
London & Home Counties, 1955–75	,,	4½	4½	108	—	4 3 4
London Passenger Transport, A	,,	—	4½	116	—	3 17 7
Do. do. B	,,	—	5	123	—	4 1 6
Do. do. C	,,	—	—	83	–1	—
West Midlands Joint Elec. 1948-68	,	—	5	114	—	4 7 6

Telegraph and Telephones.

American Tel. & Tel.	$100	9	9	107½	–2	8 7 6
Anglo-Am. Tel. Pref.	Stock	6	6	114	—	5 5 3
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cables & Wireless 5½% Pref.	,,	2¾	2¾	74½	—	3 13 10
Do. A 7½% Ord.	,,	Nil	Nil	24	—	—
Do. B Ord.	,,	Nil	Nil	10½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	10	—	2 10 0
Do. do. Pref.	10	6	6	12	—	5 0 0
Great Northern Tel.	10	20	20	33¼	+1	6 0 4
Marconi-Marine	1	10	7½	30/–	—	5 0 0
Oriental Telephone Ord.	1	12	12	3⅛	—	*3 18 4

Home and Foreign Trams, Etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	,,	5	5	450	—	—
Do. do. Pref. Ord.	,,	8	8	147½	+3d.	5 8 6
Brazil Traction	100	—	—	11⅞	+⅛	—
Brit. Columbia Elec. Rly. Pfc.	Stock	5	5	100½xd	—	4 19 6
Mexico Trams, 5% Bonds	—	5	5	22½	—	22 4 4
Mexican Light Common	100	Nil	Nil	5½	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	40	—	12 10 0
Victoria Falls Ord.	1	15	20	5½xd	—	3 12 9
Yorkshire (West Riding)	1	Nil	Nil	15/6	+6d.	—

Manufacturing Companies.

Assoc. Elec. Ord.	1	4	4	19/6	+1/9	4 2 1
Do. Pref.	1	8	8	31/3	—	5 2 5
Babcock & Wilcox	1	14	9	43/9	+1/9	—
British Aluminium Ord.	1	5	5	33/6	+5/6	2 19 8
British Insulated Ord.	1	15	15	75/–	—	4 0 0
Brush Ord.	Stock	Nil	Nil	42½	+2½	—
Callender's	1	15	15	65/–	—	4 12 4
Do. 6½% Pref.	1	6½	6½	30/9	—	4 4 6
Crompton Parkinson Ord.	5/–	22½	12½	22/6	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	95/–	—	5 5 5
English Electric	1	Nil	Nil	8/9	+⅛	—
Do. do. Pref.	1	Nil	Nil	12/6	+⅛	—
Ever Ready	5/–	35	35	29/6	+6d.	5 18 8
Ferranti Pref.	1	7	7	27/3xd	—	5 2 9
G.E.C. Pref.	1	6½	6½	31/–	—	4 3 10
Do. Ord.	1	8	8	42/6	—	3 15 3
Henley's	1	30	30	6⅞	—	4 17 1
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	15/–	—	—
Johnson & Phillips	1	5	5	18/9	—	5 6 7
Siemens Ord.	1	7½	6½	22/–	+2/–	—
Telegraph Construction	£1	Nil	Nil	28/9	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and all subsequent proceedings taken.

1932

7625. "Starting apparatus for electric motors." J. Dyson. March 15th, 1932. (403109.)

10086. "Photo-electric sound recording or reproducing apparatus." Radio Corporation of America. April 8th, 1931. (403111.)

15883. "Electric cables." Croydon Cable Works, Ltd., and J. H. C. Brooking. June 6th, 1932. (403074.)

16091. "Electric measuring instrument." General Electric Co., Ltd., H. C. Turner, and G. R. Polgreen. June 7th, 1932. (403101.)

16092. "Luminous signs comprising electric luminous discharge tubes." General Electric Co., Ltd., H. G. Jenkins, and J. W. Ryde. June 7th, 1932. (403079.)

16192. "Devices for recording to reproducing sound-films." Naamlooze Vennootschap Philips Gloeilampenfabrieken. June 9th, 1931. (403114.)

16475. "Pressure-wave transmitters and receivers incorporating magneto-strictive devices." Marconi International Marine Communication Co., Ltd., and N. P. Hinton. June 10th, 1932. (403119.)

17482. "Thermionic oscillation generators." Marconi's Wireless Telegraph Co., Ltd., and G. B. Baker. June 21st, 1932. (Cognate application 26944/32.) (403130.)

18241. "Apparatus for conveying wires in cleaning, pickling, plating, and like plants." M. Schlötter. July 2nd, 1931. (403136.)

18710. "Device for generating power steam by the use of electricity." A. F. Peterson. July 2nd, 1932. (403144.)

18839. "Electric watch." M. P. Favre-Bulle. July 4th, 1932. (403145.)

19112. "Automatic electro-magnetic contactors." A. B. Mudie. July 6th, 1932. (403147.)

19808. "Electro-optical apparatus." W. W. Jacomb and Baird Television, Ltd. July 13th, 1932. (Cognate applications 26921/32 and 34534/32.) (403155.)

20730. "Electric ship-propulsion arrangements." General Electric Co., Ltd., B. Shire, C. P. Harrison, and C. W. Saunders. July 22nd, 1932. (403162.)

22502. "Plug-and-socket connectors, switches, fuses, and the like." C. L. Arnold and M.K. Electric, Ltd. August 11th, 1932. (403174.)

23532. "Totalisators." Erricsson Telephones, Ltd., F. Limb, and J. W. Ginever. August 23rd, 1932. (403177.)

24984. "Police, fire, ambulance, and like telephone call systems." Ericsson Telephones, Ltd., P. Doig, E. Robinson, and B. A. Green. September 8th, 1932. (Addition to 384773.) (403189.)

26000. "Method and apparatus for removing a residual ripple from rectified alternating current." General Electric Co., Ltd., and D. A. Oliver. September 19th, 1932. (403196.)

27973. "Electrical musical instruments." J. Halmagyi and N. Langer. October 7th, 1932. (403204.)

28940. "Production of luminous signs, drawings, or designs in electric gas-discharge lamps." N. Lebeenko, R. Levy and W. Zeitlin. October 15th, 1931. (403208.)

29227. "Electrically operated pumps." R. L. Kent and J. N. Morris. October 19th, 1932. (403209.)

31161. "Supply of wires, *e.g.*, filaments for electric lamps or discharge tubes, towards a point of operation." Naamlooze Vennootschap Philips Gloeilampenfabrieken. November 28th, 1931. (403215.)

34556. "Telephone systems employing automatic selectors." Siemens Bros. & Co., Ltd., R. G. Dixon, and D. P. Long. December 6th, 1932. (403220.)

1933

710. "Cabinets for wireless receiving apparatus." E. K. Cole, Ltd., and E. J. Wyborn. January 9th, 1933. (403231.)

1418. "Manufacture of weatherproof luminous substances." I. G. Farbenindustrie Akt.-Ges. January 14th, 1932. (403233.)

1559. "Electrical circuit-breakers." British Electrical and Allied Industries Research Association, W. B. Whitney, and E. B. Wedmore. July 1st, 1932. (Cognate applications 1586/33 and 1693/33.) (Divided application on 27384/31.) (403235.)

3649. "Super-regenerative circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. February 5th, 1932. (Addition to 341786.) (403241.)

9737. "Electrically heated apparatus for producing vapours for disinfecting and the like purposes." J. G. Sparkhall. March 31st, 1933. (403260.)

11048. "Method of telemetering the quotient of two measured magnitudes." Landis & Gyr Akt.-Ges. July 1st, 1932. (403270.)

12639. "Television apparatus, synchronising apparatus, and the like." Marconi's Wireless Telegraph Co., Ltd. April 30th, 1932. (403283.)

14018. "Sparking plugs." R. Bosch Akt.-Ges. June 24th, 1932. (403287.)

14738. "Controllers for electric motors." Igranic Electric Co., Ltd. May 20th, 1932. (403290.)

15020. "High-voltage rectifiers having glass bulbs." Soc. Anon. Hewittic and M. De Montvignier. June 16th, 1932. (403126.)

15756. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. May 31st, 1932. (403298.)

17436. "Electric water heaters." M. W. Kirkwood. July 28th, 1932. (403307.)

19849. "Electric lamps and like devices." British Thomson-Houston Co., Ltd. July 13th, 1932. (403323.)

21061. "Radio receivers and the like." Marconi's Wireless Telegraph Co., Ltd. July 26th, 1932. (403329.)

22265. "Dry batteries." Chloride Electrical Storage Co., Ltd., and A. W. Browne. August 9th, 1933. (403336.)

22814. "Contact member for use in electric signalling systems for rail vehicles." Michelin et Cie. September 10th, 1932. (403340.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 3rd :—

Flash Battery, British Made (lettering and design). No. 542620. Class 8. Electric batteries (not for medical purposes). —H. C. Rawson (Sheffield & London), Ltd., 100, London Road, Sheffield.

Donvac. No. 546209. Class 6. Vacuum cleaning machines.—Associated Domestic Appliances, Ltd., 17, Exchange Buildings, Market Place, Doncaster.

Ethovisor. No. 544294. Class 8. Television apparatus, radio-telephonic transmitting and receiving apparatus, and parts thereof.—Grafton Radio, Ltd., 79, Lots Road, Chelsea, S.W.10.

Defiant. No. 546619. Class 8. Radio-telephonic and telegraphic apparatus and parts thereof.—Co-operative Wholesale Society, Ltd., Balloon Street, Manchester.

Granodizer. No. 544674. Class 8. Apparatus for electrolytic plating.—American Chemical Paint Co., Lower Gwynett, Penn., U.S.A. (British representatives : Boult, Wade & Tennant, 112, Hatton Garden, E.C.1)

Commercial and Industrial Electric Heating in Japan

IN a recent issue of the *Japan Nickel Review* Mr. Yoshijiro Ishikawa, managing director of the Kyoto Electric Light Co., Kyoto, says that for almost five years during and after the war the demand for electricity for power purposes grew so keen, with limited supply, that there was practically no power available for other purposes, which delayed the development of heating. The economic crisis after the war, however, caused a large surplus of power, which increased with the completion of new generating stations planned during the boom period. Also, improvements in the manufacture of resistor wires and heating apparatus, followed by a rise of fuel prices, changed the general conditions of the heat-utilising industries to the benefit of electricity supply undertakings.

Since the Imperial Hotel Co., Tokyo, in 1922, decided to electrify all its heating, including the cooking, laundry, and other departments in its new building, the demand for electricity for heating has increased to a marked degree. At the end of 1930, the total electric power utilised in Japan for heating reached 379,192 kW, supplying 207,763 customers. There was an increase of about five times in five years.

The "tenter" is a machine used in dye-works for dressing textile widths that have shrunk while dyeing, by stretching both edges with clips and drying the humidified cloth while it is moved over the heat. Formerly, charcoal, gas and steam were the sources of heat employed, with their respective inherent drawbacks. Electrification was first tried in one of the dye-works in Kyoto in 1918, and satisfactory working conditions were established in November, 1922.

In an induction type of heater of original Japanese design, the primary magnetising current is made to produce eddy currents which are converted into heat for cylindrical dryers as used in dye-works. Since the electric singeing machine was first designed and satisfactory results were obtained in 1927, many improvements have been made in this process. The latest heating element is a resistor made of a nickel-chromium alloy ribbon, which is connected alternately from both sides, and over which the cloth slides continuously. The Schreiner machine is provided with a roll grooved with numerous small lines on its face, and is used to produce an intense lustre on textiles by rolling and heating as a finishing process.

For glazing, porcelain (decorated with pictures, patterns, and colours) is generally put in a kiln for the secondary finishing process. Formerly, the heat treatment was effected by putting the articles in a casing exposed to a wood-fire flame. In 1924 the Nagai Electric Heating Apparatus Co. introduced an electrically heated kiln and demonstrated the adaptability of electric heat for this kind of work. In Nagoya, the great centre of the porcelain industry, advantage is taken of the low rate for electrical energy utilised after midnight.

The simplicity and convenience of electric heat provided by multiple-unit hot-plates has solved all rice-cooking problems. Such units can be used one on top of the other in piles, thus economising space. The units are of 3.5-kW capacity, which is sufficient for preparing 16½ lb. of rice. For broiling a special kind of charcoal was for a long time used as the source of heat, until the first electric cooker appeared in Kyoto in 1927. To minimise the renewal of the heating element, which is subject to the deteriorating action of dripping fats and sauces, heavy conductors of nickel-chromium are used at reduced voltage obtained from special transformers, and the heat control is on the primary side.

For commercial and industrial electric heating the common practice is to adopt the same rate as that charged for motor power.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Extensions, National Library of Wales (£50,000); Henry Willcock & Co., builders, Wolverhampton.

Ashington.—Houses (25) for aged people; U.D.C. surveyor.

Ashton-under-Lyne.—Houses (200), Stamford Estate, Waterloo; Ridyard & Sons, Ltd., builders.

Banstead (SURREY).—Houses (124), Garden Field Estate, Burgh Heath, for F. S. & A. Woods. General Post Office, for H.M. Office of Works, King Charles Street, London, S.W.

Barking.—Houses (95) and flats, Movers Lane Estate, and maternity hospital (£10,000); borough architect.

Bedale (YORKS).—Houses (38); U.D.C. surveyor.

Birmingham.—Church, Gregory Avenue, Weoley Castle Estate; Roman Catholic authorities. Cinema, Gregory Avenue, Weoley Castle Estate; J. M. McIntosh, 6, Cherry Street. Factory at the corner of Adderley Street and Liverpool Street for Gaskell & Chambers, Ltd., 50, Dale End. Factory for W. W. Greener, Ltd., St. Mary's Square (£6,000) with electrical work; W. C. Skinner, builders, 316, Birchfield Road, Perry Barr. Shops, Alcester Road, King's Heath, for Jack Cotton, 35, Waterloo Street; B. Whitehouse, Ltd., builders, Monument Lane. Elementary School, Lakey Lane, Hall Green, for E.C.

Birstall.—Houses (30), Nova Lane; U.D.C. surveyor.

Blackpool.—Houses (36), Holyoake Road; Warbreck Building Co., Ltd. Church, Grasmere Road; Methodist trustees. Cinema and shops, Lytham Road; Majestic Cinema Co.

Blyth.—Houses, Crawford Street; L. Leeper, borough engineer.

Bootle.—Houses (108), Caddick's Estate, and 110 houses, Pleasant View; borough engineer.

Bradford.—Nurses' accommodation to St. Luke's Municipal Hospital (£26,000); Mr. Fletcher, Town Hall.

Brighouse.—Houses (157); borough surveyor. Rebuilding silk factory, Clifton Bridge, for Thomas Binns & Co., Ltd.

Canterbury.—Houses; city surveyor.

Cardiff.—Houses (500), Ely and Tremorfa Estates; city engineer. Baden Powell School (£18,000), for E.C.

Cheadle & Gatley.—Houses (700) and shops, Pendlebury Estate, Gatley, for J. T. Pendlebury.

Cheshire.—Three schools, Sale district (1,360 places), for County E.C.; director of education, Chester.

Chesterfield.—Bus station (£7,500), Vicar Lane; James Colliss & Sons, builders, 21, Saltergate.

Devonshire.—Secondary schools, Crediton, Bideford, Exmouth and Teignmouth, for County E.C.; R. N. Armfelt, secretary, Exeter.

Doncaster.—School (500 places), Wheatley; director of education.

Dover.—Blocks of flats, Limekiln Street; borough surveyor.

Edinburgh.—Houses (71), Glenlee Gardens, &c.; Stewart Kaye, architect, 14, Hill Street. Houses (294), and shops, Niddrie Mains housing area; city architect.

Essex.—School, Dagenham Heath (£31,546); Pavitt Bros., Ltd., builders, Aveley. Secondary school, Parsloes Avenue, Dagenham, and junior school, Nutberry Estate, Grays, for County E.C.; director of education, Chelmsford.

Glasgow.—Church, Gt. Western Boulevard; U.F. Church trustees.

Halifax.—School (480 places), Ovenden, for Borough E.C.; director of education.

High Wycombe.—General post office, Queen Victoria Road, for H.M. Office of Works, King Charles Street, London, S.W.

Houghton-le-Spring.—Houses (61); A. H. Balmer, builder.

Hull.—Stores, Greenwood Avenue; Co-operative Society, Ltd.

Ilford.—Houses (50), Bergholt Road; P. G. Ashton. Houses (124), Headley Drive, &c.; J. Aldridge. Houses (60), Mannin Road, &c.; P. Triplete, Ltd.

Ilkeston.—Houses (64), Nottingham Road Estate; borough engineer.

Irish Free State.—(CLAREMORRIS, Co. MAYO).—District hospital for the Mayo Board of Health; P. J. Munden, chartered architect, 1, South Frederick Street, Dublin.

Kincardineshire.—School, Inverbervie (£6,000); county clerk, Stonehaven.

Lancashire.—Nurses' home, Patricroft Institution, Eccles (£13,750), for P.A.C.; county architect, Preston.

Leeds.—Cinema and shops, Harrogate Road; Newsam & Gott. Extensions, Institution for the Blind; Education Committee architect.

London.—(FINCHLEY).—Flats (40), Etchingham Park Road; W. Hollis. Swimming pool (£7,000); borough engineer.

Longton (STAFFS).—Houses (24), Sutherland Road; Church Army Housing Ltd.

Lymm (CHESHIRE).—Houses (30), Star Lane, for Curbishley Bros.

Lytham St. Annes.—Houses, Kilnhouse Lane; borough surveyor.

Macclesfield.—Houses, Poynton (£8,120); J. J. Parrott, builder, Bollington Cross.

Manchester.—Houses (250), Brownley Green; Corporation Housing department. Block of shops, Holyhedge, Wythenshawe Housing Estate; G. & J. Seddon, Ltd., builders, Little Hulton. Elementary school, Crowcroft Park; Robert Carlisle & Co., Ltd. School, Haverley Hey, for E.C.

Morayshire.—School, Elgin, for C.C.; R. B. Pratt, architect, Elgin.

Newcastle-on-Tyne.—Houses (136), Walkergate; W. C. Leach, builder, Coutts Road, Walkergate. Houses (22), Welbeck Road; Robson & Co., builders, Welbeck Road.

Northamptonshire.—Children's home, Raunds, for C.C.; H. S. Martin, County Hall, Northampton.

North Riding.—Senior schools, Westcliff, Whitby, for County E.C.; J. C. Wrigley, secretary, Northallerton.

Norwich.—Re-erection of boot factory, Pitt Street, for Barker & Ramsbottom.

Paisley.—Hospital, Hawkhead (£100,000); Sir John Burnet Tait & Lorn, architects, London.

Petersfield (HANTS).—Public hall with Council offices; Seely & Paget, architects, 3, Queen's Square Mews, London, S.W.

Plymouth.—Baths, Hoegate Street (£4,500), and extensions, County Courts (£7,700); borough engineer.

Purlwell (NR. BATLEY).—Houses (30) (£8,150); borough engineer and surveyor, Town Hall, Batley.

Retford.—Extensions, National schools; W. Southall, architect, Chapelgate.

Romford.—Houses (48), Rainham; R.D.C. surveyor.

Rushden.—Houses, Bedford Road, for the Industrial Co-operative Society, Ltd.; R. J. Williams and Partners, architects, Market Street, Kettering.

Rutherglen (LANARKSHIRE).—R.C. church (£25,000); R.C. Archdiocese of Glasgow.

St. Helens (LANCS).—Houses (196), Grange Park; borough surveyor.

Sheffield.—Houses (78), Lees Hall Road; W. & J. Laver. Factory, Little London Road; R. J. Stokes & Co., Ltd. Houses (36), Marsh Avenue; J. Marsh. Houses (54), Woodthorpe Arms Estate; J. H. Naylor & Son. Houses (316), Wybourn Estate; Corporation Estates Committee.

Sherburn-in-Elmet.—Bacon factory for the West Riding branch of the Yorkshire Farmers' Union (£20,000) with electrical installations; R. M. Thompson, Ltd., builders, South Milford, Yorks.

Shrewsbury.—Rebuilding business premises, Mardol Head, for William Major, Ltd. Infants' school, Racecourse Crescent, Monkmoor, with electrical work; A. W. Ward, surveyor, Guildhall.

Southall.—Houses (115), Brent Road; General Housing Co.

Southport.—Film studios; National Film & Theatrical Service. Hotel and flats, Queen's Road; Hodge & Halsall.

South Shields.—Houses (23); J. H. Morton & Sons, architects, Fowler Street. Houses (26); G. Thornton & Sons, builders, Morpeth Avenue. Houses (750); J. Reid, borough engineer. Houses (40); W. J. Robertson & Son, builders, Mowbray Road. Houses (28); Melton Swales, builder, Imeary Street.

Springhead (LANCS).—Houses (24); U.D.C. surveyor.

Starcross.—Mental colony; Devon, Somerset & Dorset C.C.

Stockport.—Houses, Cheadle Heath; borough surveyor.

Stockton-on-Tees.—Houses (360), Norton Road, for Lane Fox & Co.; G. P. Stainsby, architect. Aerodrome; borough engineer.

Stone (STAFFS).—Bazaar stores, High Street, for F. W. Woolworth & Co., Ltd.

Sutton Coldfield.—Houses (17), Bakers Lane; T. A. Glynn. Houses (20), Lakehouse Road; S. Spollen. Houses (48), Maney Hill Road; R. H. Bridge.

Tipton.—Works extensions, Albion Street; Chatwins, Ltd.

Wakefield.—Premises, Upper Kirkgate; Marks & Spencer, Ltd. Extensions, Central Library; P. Morris, architect, Town Hall, Wakefield. Extensions, Lawefield School; city architect.

Wallasey.—Shops and houses, Reeds Lane; borough engineer.

Walsall.—Houses (21), Lord Street (£5,500); L. G. Peace.

Warlingham.—Twenty-six shops and flats, Hamsey Green; Johns & Freeland for Marstock, Ltd.

Warrington.—Church, Elmwood Avenue (£4,773); Frank Warburton & Son, builders, Stockton Heath. Extensions to business premises, including shopping arcade (electrical work), for W. Hodgkinson, Ltd., Bridge Street; Courtney Pope & Co., Ltd., 339, Seven Sisters Road, London, N.

Watford.—Block of shops and flats, Dalton House site, High Street; H. Thorne.

West Hartlepool.—R.C. school, Hart Lane; J. Garry, architect, Church Street.

West Riding.—Schools, Hatfield and Stainforth, for County E.C.; director of education, Wakefield.

West Sussex.—Schools, Bognor, Fishergate, Lancing, and Shoreham, for County E.C.

West Wickham (KENT).—Church, Park Langley; Martin Travers, architect, Colet Gardens, London, W.

Whitby.—Houses (150); U.D.C. surveyor.

Whitley Bay.—Houses (24), Hartley Avenue; R. & A. P. Tait, builders.

Wolverhampton.—Houses (56), Argyle Road; J. Walton. Houses (120), Low Hill Estate (£32,578); A. M. Griffiths & Son, Ltd. Houses (58 and shops, Rooker Road; A. T. & B. Butler.

Worthing.—Station for the Southern Railway Co., Ltd. Houses (170), Meadow Road, &c.; H. M. Potter, architect. Assembly hall, Town Hall (£49,382); Trollope & Colls, Ltd.

York.—Houses (26), Burton Grange Estate; A. Temple. Extensions, head post office, Lendal, for H.M. Office of Works, King Charles Street, London, S.W.

A French "Safety" Scheme

A feature of the annual International Fair which is to be held in Lyons in March next is to be a series of daily conferences on "Safety in the House, in Works, and in Public Establishments." In the Gas and Electricity Section attention will be given to existing and projected regulations governing the distribution of electricity, safety in electricity generating stations and in overhead and underground distributing systems, safety in electrical installations in private buildings and works, general safety in the utilisation of electricity, and finally, the application of the photo-electric cell to safety devices.